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NORTH VANCOUVER, B.C.

DIOXIN AND FURAN LEVELS IN SEDIMENTS, FISH AND INVERTEBRATES FROM FISHERY CLOSURE AREAS OF COASTAL BRITISH COLUMBIA

Regional Data Report 90-09

by

L. E. Harding and W.M. Pomeroy

July, 1990

REVIEW NOTICE

Data reports are prepared to make preliminary data available without full analysis or interpretation. This report has been reviewed by the Marine and Estuarine Programs Division, Environmental Protection, and approved for limited distribution. For further information please contact:

Lee Harding
Manager, Marine and Estuarine Programs
Environment Canada
Environmental Protection
Conservation and Protection
224 West Esplanade Avenue
North Vancouver, B.C.
V7M 3H7

ABSTRACT

In November, 1988, partial results of a continuing national dioxin survey by Environment Canada and Fisheries and Oceans Canada were released, showing unacceptably high levels of dioxins and furans in some marine invertebrates. This resulted in closures of some crab, shrimp and prawn fisheries in Hove Sound and near Prince Rupert. Three companies operating pulpmills at these locations were required by Environment Canada and Fisheries and Oceans Canada, under authority of the Fisheries Act and the Canadian Environmental Protection Act, to undertake further sampling and analysis to determine the extent of contamination. Results of these company studies, released in May, 1989, demonstrated some contamination outside the closure area boundaries. As a result, the closure areas were extended.

In November, 1989, further results of the national dioxin survey by Environment Canada and Fisheries and Oceans Canada were released, demonstrating the presence of dioxins and furans in harvested fish and shellfish species at 7 new locations: Kitimat, Elk Falls-Campbell River, Gold River, Nanaimo, Crofton, Cowichan Bay and Powell River. Companies with industrial operations that were thought to be or known to be sources of dioxins and furans in these areas were required to undertake studies similar to those of the original three mills, under the same authority. These companies included Fletcher Challenge Canada Limited's pulp mills at Crofton and Campbell River; MacMillan Bloedel Limited's two pulp mills at Nanaimo and Powell River; Canadian Pacific Forest Products Limited's pulp mill at Gold River, Raven Lumber Limited's sawmill at Campbell River, Doman Forest Products Limited's sawmill at Cowichan Bay and Westcan Terminals Limited's shipping terminal at Cowichan Bay. Reports detailing the results of these studies were provided to Environment Canada, and are listed in the References.

At Kitimat, no obvious source of the dioxin and furan congeners that were implicated in the crab fishery closure were identified (the Eurocan pulpmill there does not use chlorine bleaching). Analysis of various inplant waste streams and effluents at the pulpmill, the Ocelot methanol plant and the Alcan aluminum smelter did not suggest sources of contamination. Nevertheless, Eurocan and Alcan undertook voluntary, limited additional sampling.

Results of these company sampling programs are tabulated in this report to make the data available in one, easily accessible format. This summary of results is provided as a convenience for researchers in this field, and is not intended to take the place of the original company reports, which have been made public.

RESUME

En novembre 1988, les ministères canadiens de l'environnement et des Pêches et des Océans ont présenté des résultats partiels de leur étude permanente nationale sur les dioxines. Selon ces résultats, certains invertébrés renerment des concentrations de dioxines et de furanes dépassant les normes. Dans la baie de Howe et près de Prince Rupert, on a dû fermer certaines pêches du crabe et des crevettes de petite et de grande taille. Trois compagnies y exploitant des usines de pâte ont été sommées par ces deux ministères, en vertu de la Loi sur les pêches et de la Loi sur la protection de l'environnement, d'effectuer d'autres échantillonnages et analyses pour déterminer l'ampleur de la contamination. Les résultats des études de ces compagnies, divulgués en mai 1989, indizuaient que la contamination débordait des zones fermées. Ces dernières ont donc été agrandies.

En novembre 1989,environnement Canada et Pêches et Océans Canada faisaient connaitre d'autres résultats de leur étude nationale sur les dioxines. Des dioxines et des furanes avaient été détect dans des poissons, des crustacés et des coquillages pêches à sept autres endroits Kitimat, Elk Falls-Campbel River, Gold River, Nanaimo, Crofton, Covichan Bay et Powell River. On a demandé aux compagnies dont les installations dans ces régions étaient des sources possibles ou connues de dioxines et de furanes de mener des études semblables à celles demandées aux trois usines précédentes, en vertu des mêmes lois. Les installations en cause étaient : les usines de pâte de la Fletcher Challenge Canada Ltée à Crofton et Campbell River, de la MacMillan Bloedel Ltée à nanaimo et Powell River et de Produits forestiers Canadien Pacifique Ltée à Gold River; la scierie de la Raven Lumber Ltée à Campbell River er celle de la Doman Forest Products Ltée à Covichan Bay et; le terminal de la Westcan Terminals Ltée aussi là Covichan Bay. Les rapports présentant lest résultats de ces études ont été soumis à Environnement Canada; ils sont metionnées dans la bibliographie du présent document.

A Kitimat, on n'a détecté aucune source évidente de congénères de dioxine et de furane, substances responsables de la fermeture de la pêche de crabe (l'unsine de pâte d'Eurocan à cet endroit ne fait pas de blanchiment au chlore). Les analyses visant à détecter des contaminants dans les eaux us'ees circulant dans diverses conalisations des installations et dans les effluents de l'usine de pâte, de l'usine de méthanol d'Ocelot et de l'aluminerie dl'Alcan ont donné des résultats négatifs. Eurocan et Alcan ont tout de même volontairement effectué des échantillonnages supplémentaires limités.

Le présent rapport réunit sous forme de tableau, pour qu'ils puissent être consultés facilement, les résultats des programmes d'échantillonage menés par ces compagnies. Ce condensé a été préparé à l'intention des chercheurs oeuvrant dans ce domaine et ne remplace pas les rapports originaux des compagnies, lesquels ont été rendus publics.

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1.0 INTRODUCTION

In November, 1988, partial results of a continuing national dioxin survey by Environment Canada and Fisheries and Oceans Canada were released, showing unacceptably high levels of dioxins and furans in some marine invertebrates. This resulted in closures of some crab, shrimp and prawn fisheries in Howe Sound and near Prince Rupert. Three companies operating pulpmills at these locations were required by Environment Canada and Fisheries and Oceans Canada, under authority of the Fisheries Act and the Canadian Environmental Protection Act, to undertake further sampling and analysis to determine the extent of contamination. Results of these company studies, released in May, 1989, demonstrated some contamination outside the closure area boundaries. As a result, the closure areas were extended.

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company sampling programs are tabulated in this report to make the data available in one, easily accessible format. This summary of results is provided as a convenience for researchers in this field, and is not intended to take the place of the original company reports, which have been made public.

2.0 MATERIALS AND METHODS

2.1 Sample Collection

Samples of marine sediment and fish and invertebrate tissues for this study were collected during January-February, 1989 in Howe Sound and Prince Rupert, and January-February, 1990 in the other areas. Sample stations are shown in Figures 1-20. Detailed methods are given in the reports listed in the References.

2.2 Analytical Procedures

Methods of analysis and quality assurance/quality control program specified for this work are given in Appendix I.

All samples were spiked with an aliquot of 13C-labelled internal standards (tetrachlorodioxin, tetrachlorofuran, pentachlorodioxin, hexachlorodioxin, heptachlorodioxin and octachlorodioxin) prior to analysis. Sediment samples were ground with sodium sulfate and soxhlet extracted. Effluents samples were filtered; the particulate was soxhlet extracted, the liquid was stirred with dichloromethane and the extracts combined. Tissue samples were ground with sodium sulfate, packed in a glass column and eluted with solvent. The extracts were subjected to a series of cleanup steps and then analyzed by gas chromatography with mass spectrometric detection (GC/MS).

Detailed methods for dioxin and furan analysis as well as for the other parameters not reported here are given in the reports listed in the References.

3.0 RESULTS

All analytical results for dioxins and furans are given in Tables 1-20. The analytical QA/QC results for surrogate recoveries, blanks and duplicates met the specified standards. Figures 21-27 show the relative amounts of 2,3,7,8 tetrachlorodibenzo-p-dioxin in fish and invertebrate tissues at each location. The circles are proportional to the natural logarithm of the corresponding data in Tables 1-20; results less than the detection limits are shown as triangles. Quality assurance/quality control analyses for selected split samples are reported in Table 21.

REFERENCES

Dvernychuk, L.W., 1989. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1989. Prepared for Howe Sound Pulp and Paper Ltd., Port Mellon, B.C. and Western Pulp Partnership Ltd., Woodfibre, B.C.

Dvernychuk, L.W., 1989. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1989. Prepared for Skeena Cellulose Ltd., Prince Rupert, B.C.

Dvernychuk, L.W., 1990. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1990. Prepared for Fletcher Challenge Canada Limited, Campbell River, B.C.

Dvernychuk, L.W., 1990. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1990. Prepared for Fletcher Challenge Canada Limited, Crofton, B.C.

Dvernychuk, L.W., 1990. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1990. Prepared for MacMillan Bloedel Limited, Powell River, B.C.

Dvernychuk, L.W., 1990. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1990. Prepared for MacMillan Bloedel Limited, Nanaimo, B.C.

Dvernychuk, L.W., 1990. Effluent, Receiving Water, Bottom Sediments and Biological Tissues: A Baseline Organochlorine Contamination Survey, January/February 1990. Prepared for Raven Lumber Limited, Campbell River, B.C.

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Beak Associates Consulting (B.C.) Ltd., 1990. Baseline Organochlorine Monitoring Program. Prepared for Canadian Pacific Forest Products Limited, Gold River, B.C.

Konasewich, D., 1990. Baseline Contamination Study: Nearshore Area of Covichan Bay. Prepared for Westcan Terminals Ltd.

Konasevich, D., 1990. Baseline Contamination Study: Nearshore Area of Covichan Bay. Prepared for Doman Forest Products Ltd.

ACKNOWLEDGEMENTS

L. Harding and M. Pomeroy designed the survey program requirements (Appendix II). M. Pomeroy managed the studies in consultation with the companies and their consultants listed in the References. Mike Nassichuk (Department of Fisheries and Oceans) provided information on fisheries resources and assisted in selection of fish and invertebrate sampling stations. Mike Makhijani prepared the data tables and figures using QUIKMap geographic information system and DBASE III data files.

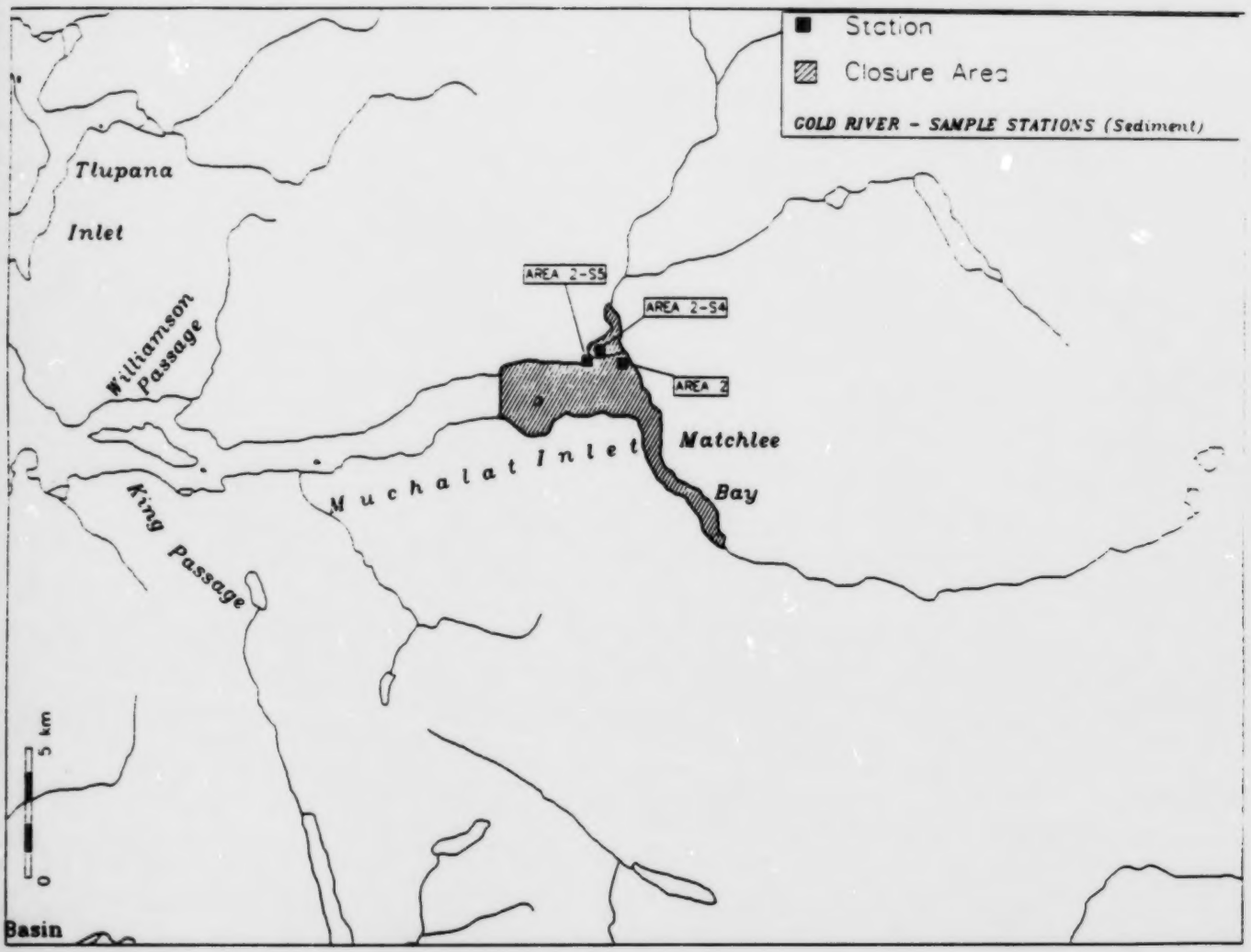

Figure 1: Sediment sampling stations at Gold River.

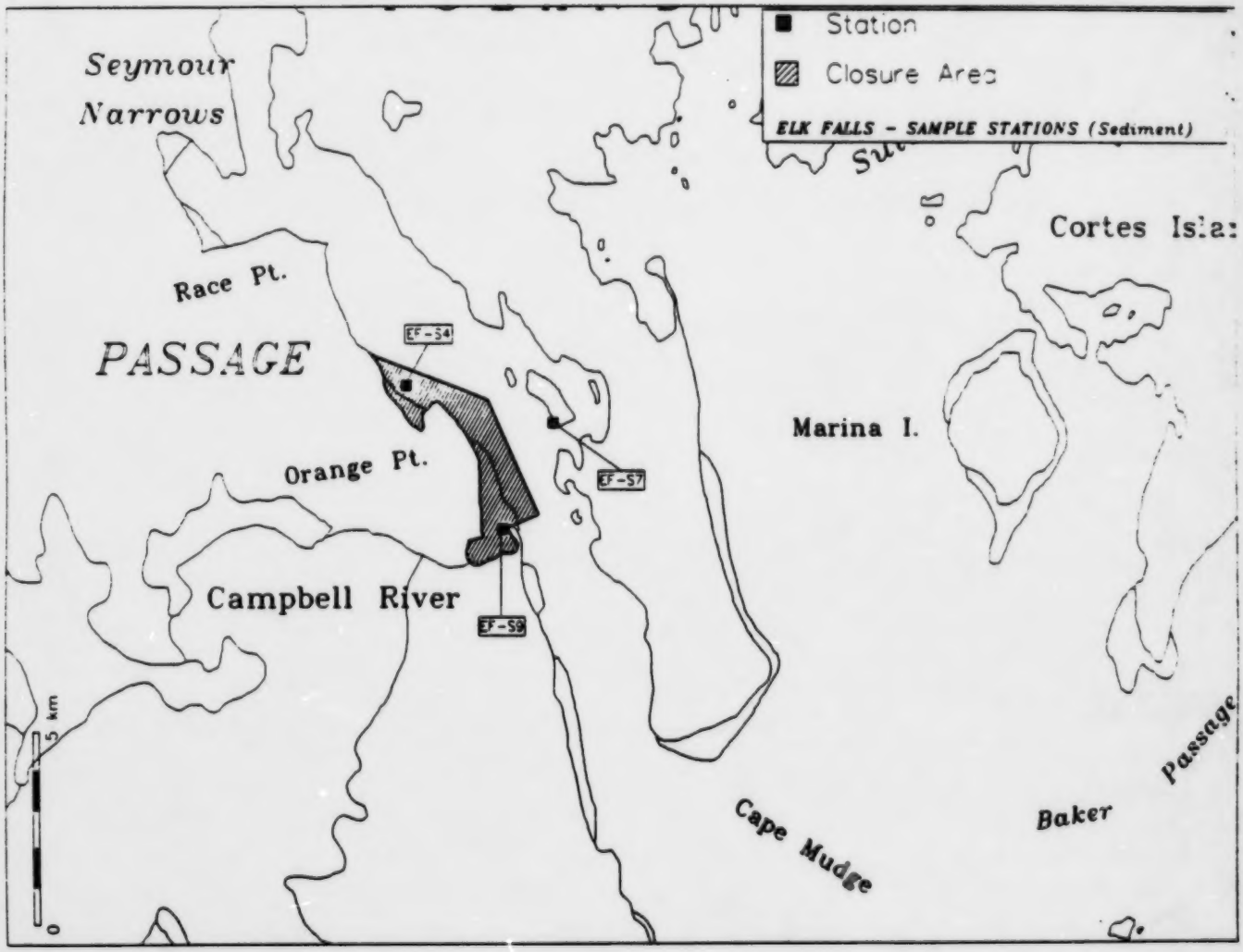

Figure 2: Sediment sampling stations at Elk Falls.

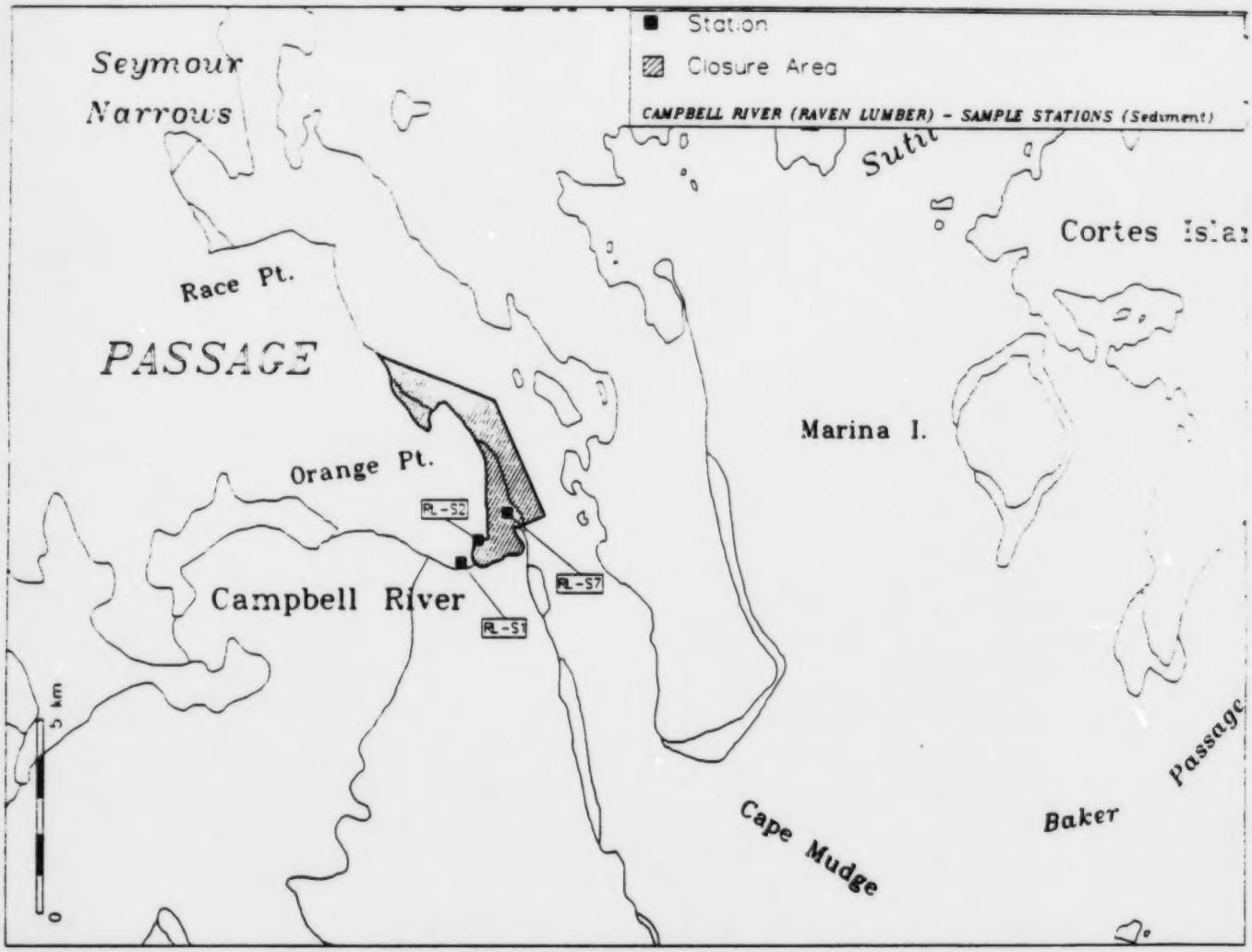

Figure 3: Sediment sampling stations at Campbell River.

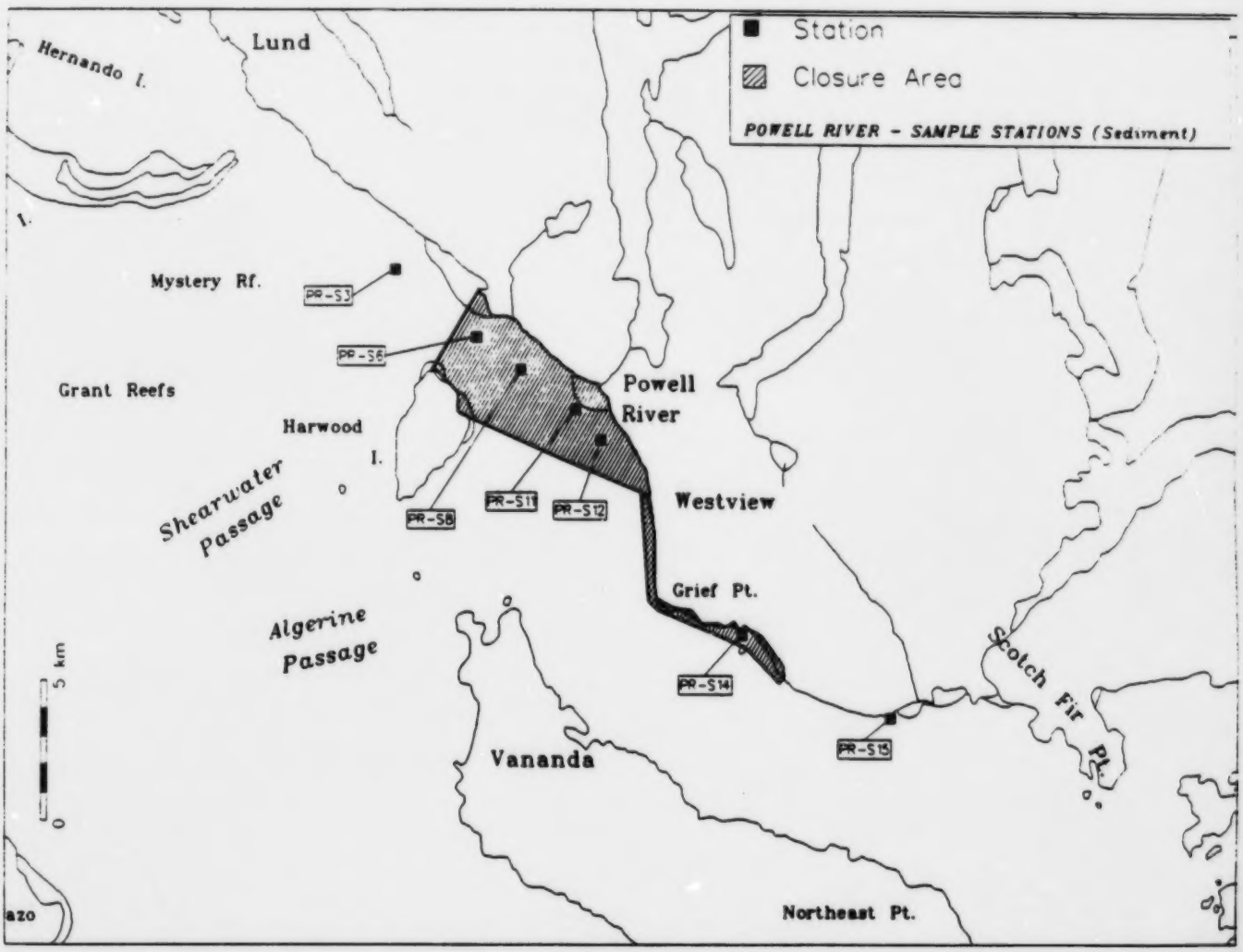

Figure 4: Sediment sampling stations at Powell River.

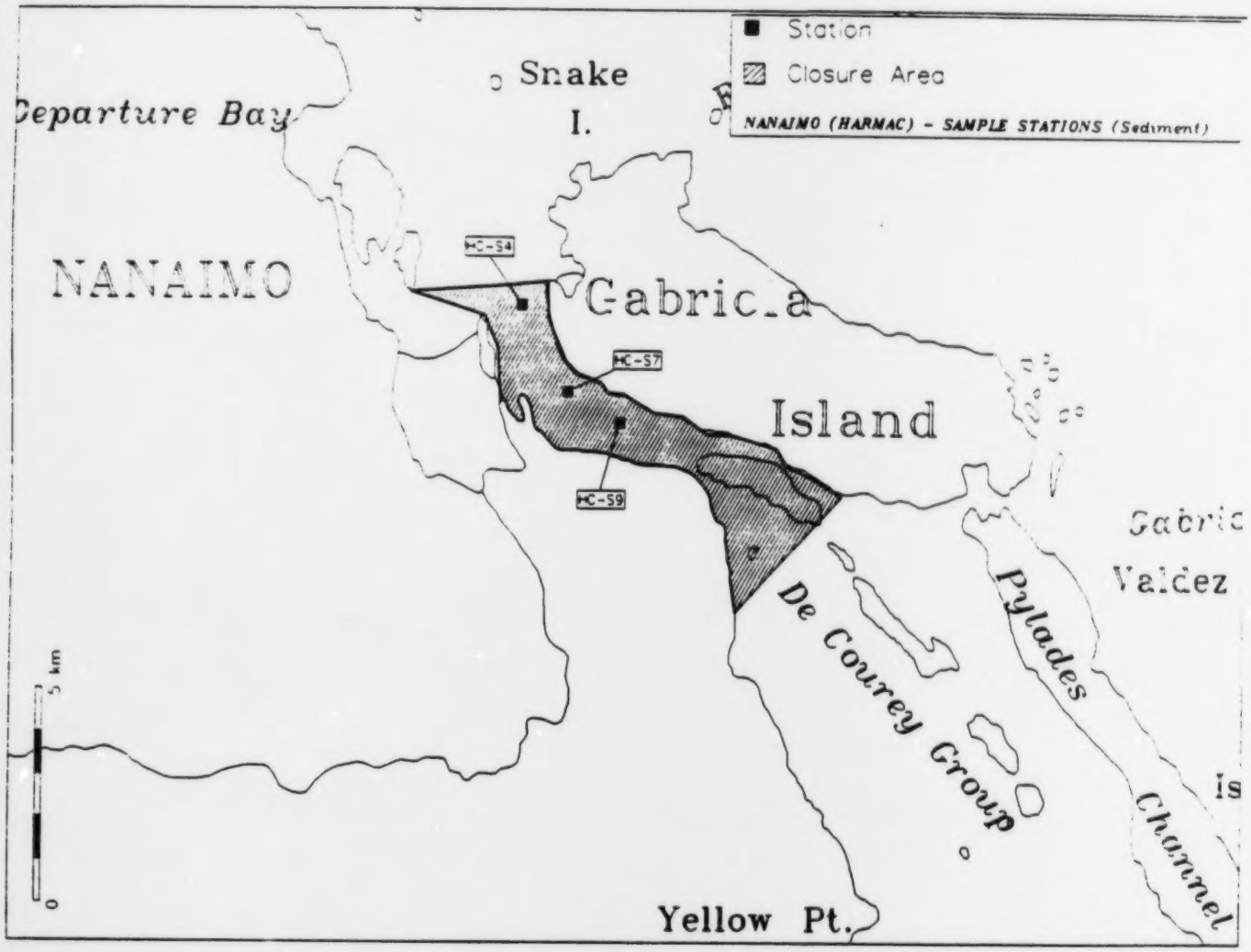

Figure 5: Sediment sampling stations at Nanaimo.

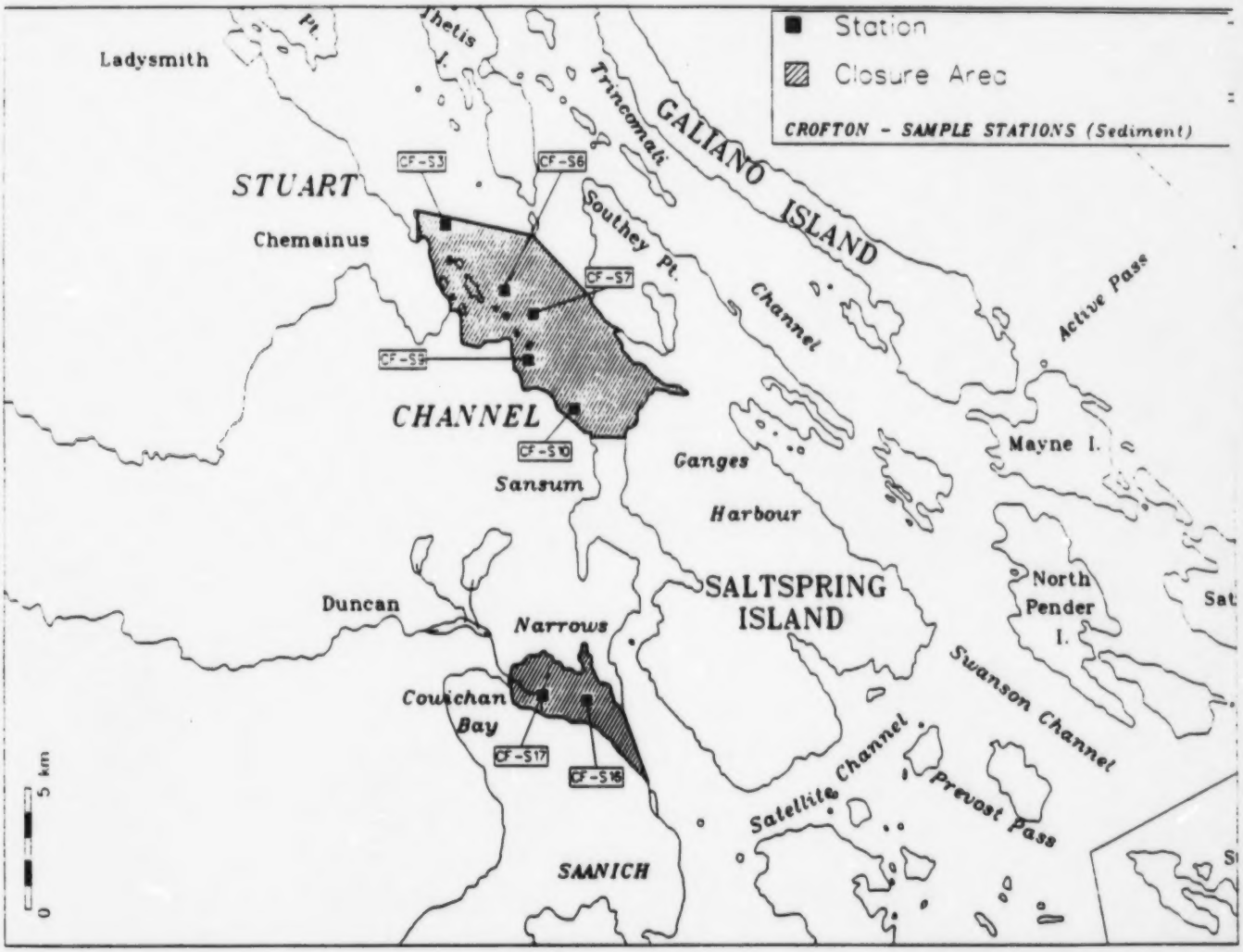

Figure 6: Sediment sampling stations at Crofton.

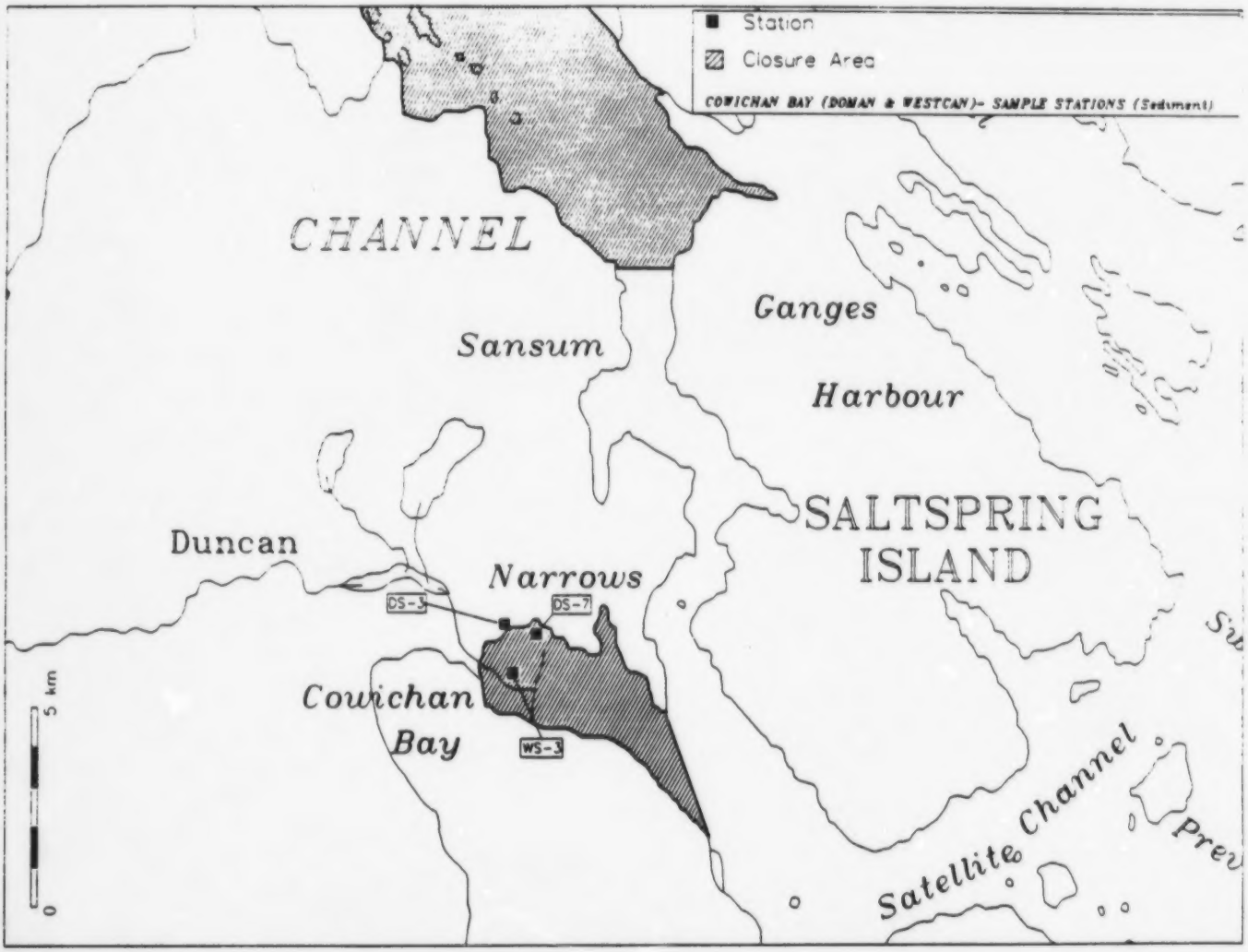

Figure 7: Sediment sampling stations at Cowichan Bay.

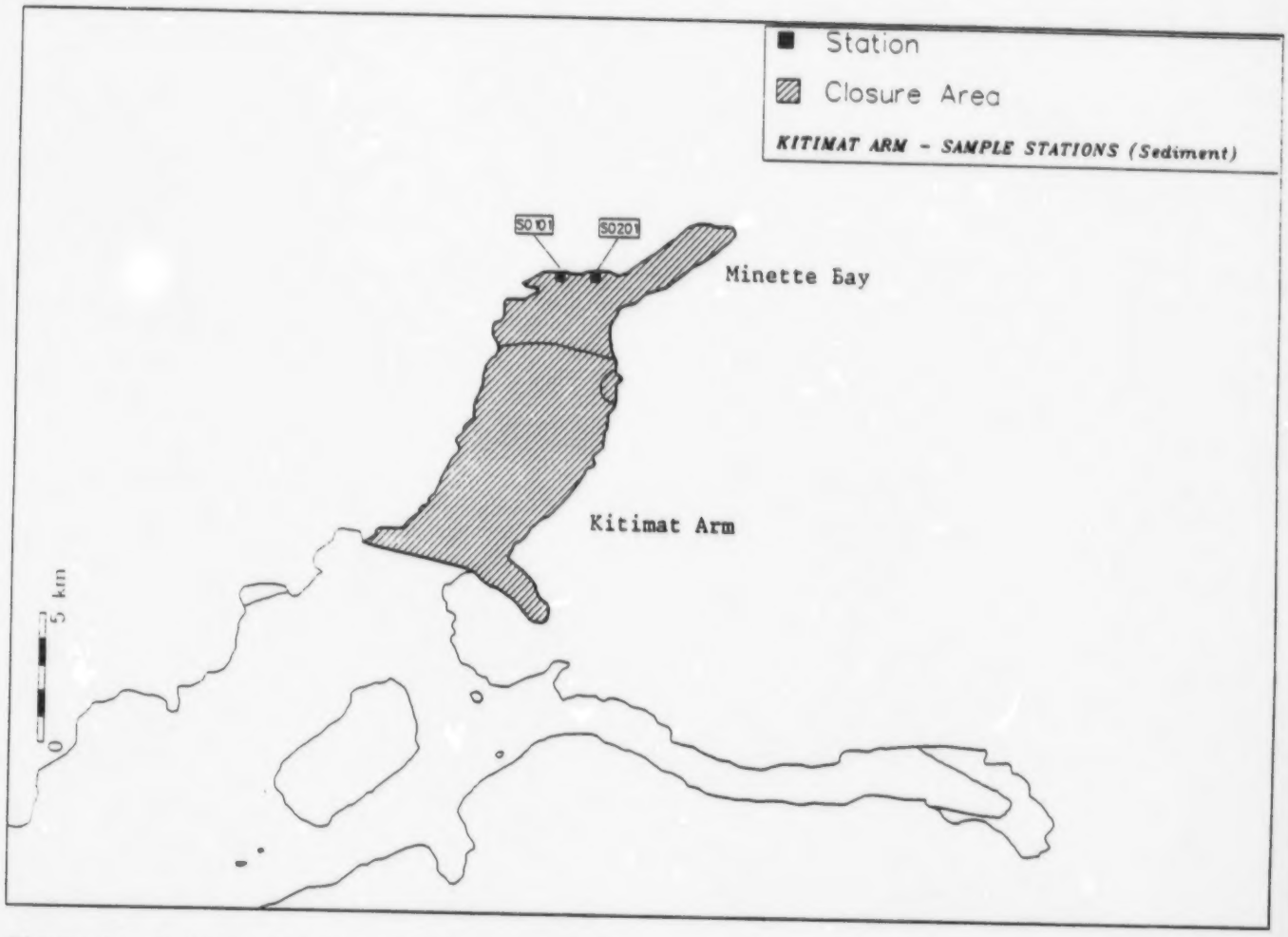

Figure 8: Sediment Sampling Stations at Kitimat.

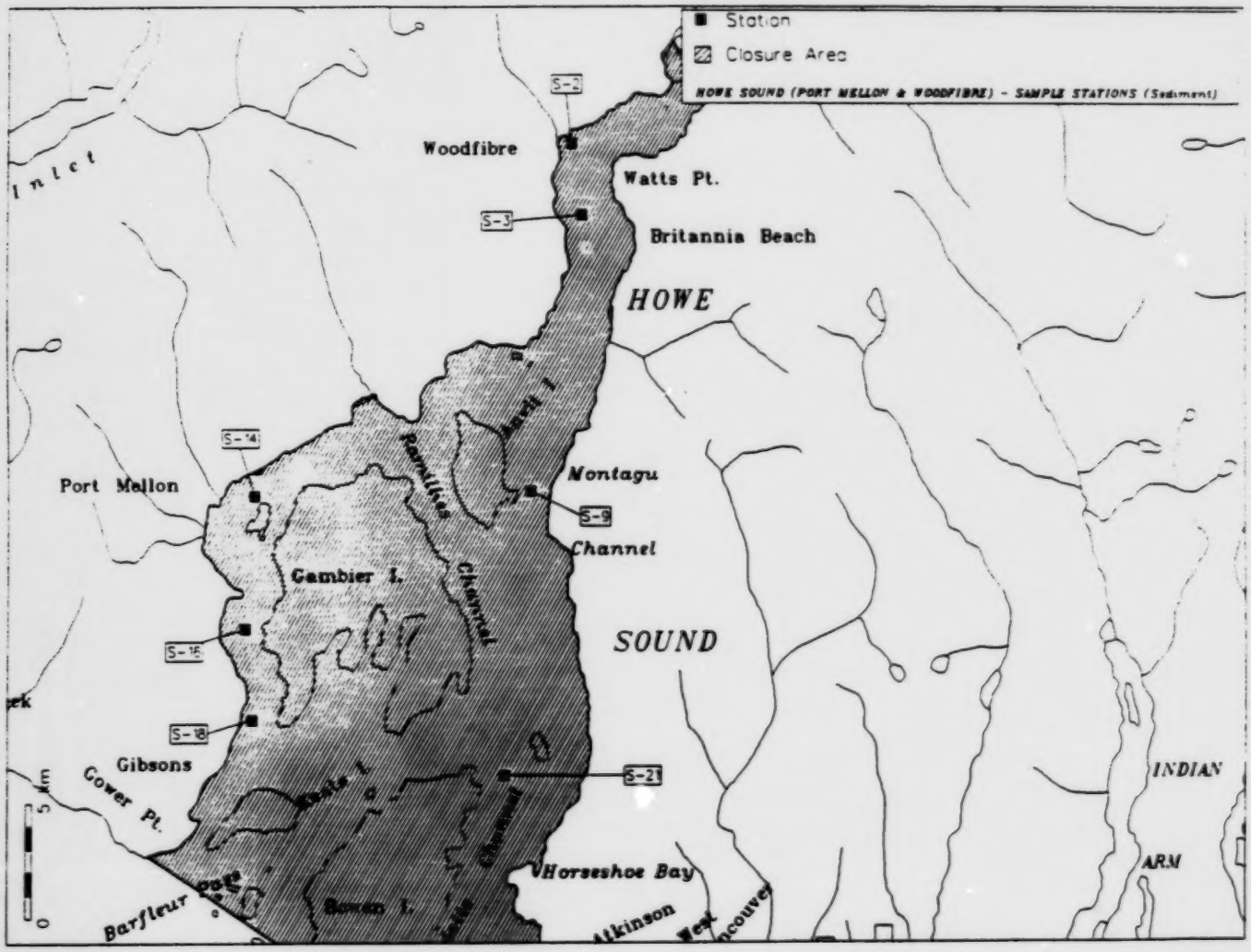

Figure 9: Sediment sampling stations at Howe Sound.

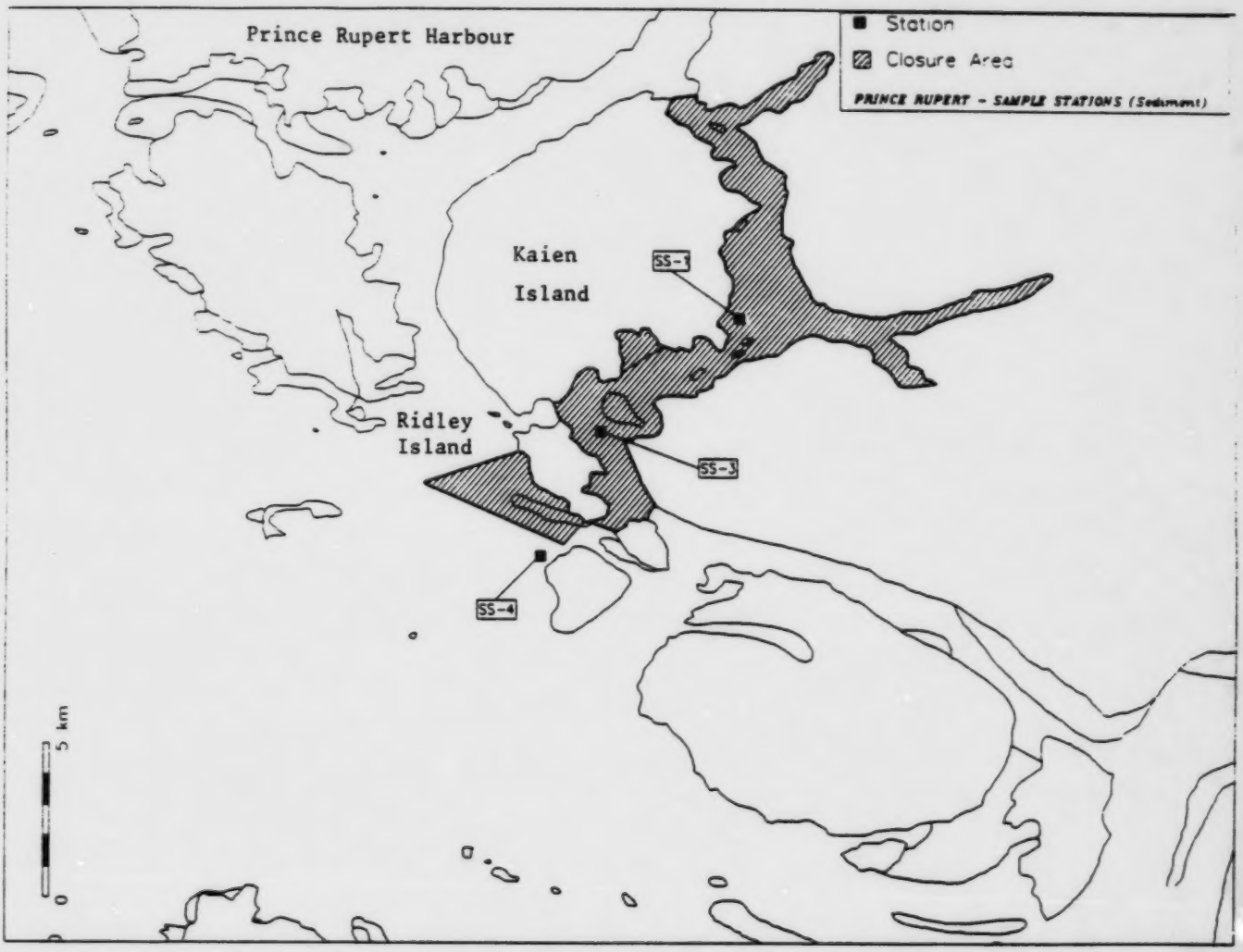

Figure 10: Sediment sampling stations at Prince Rupert.

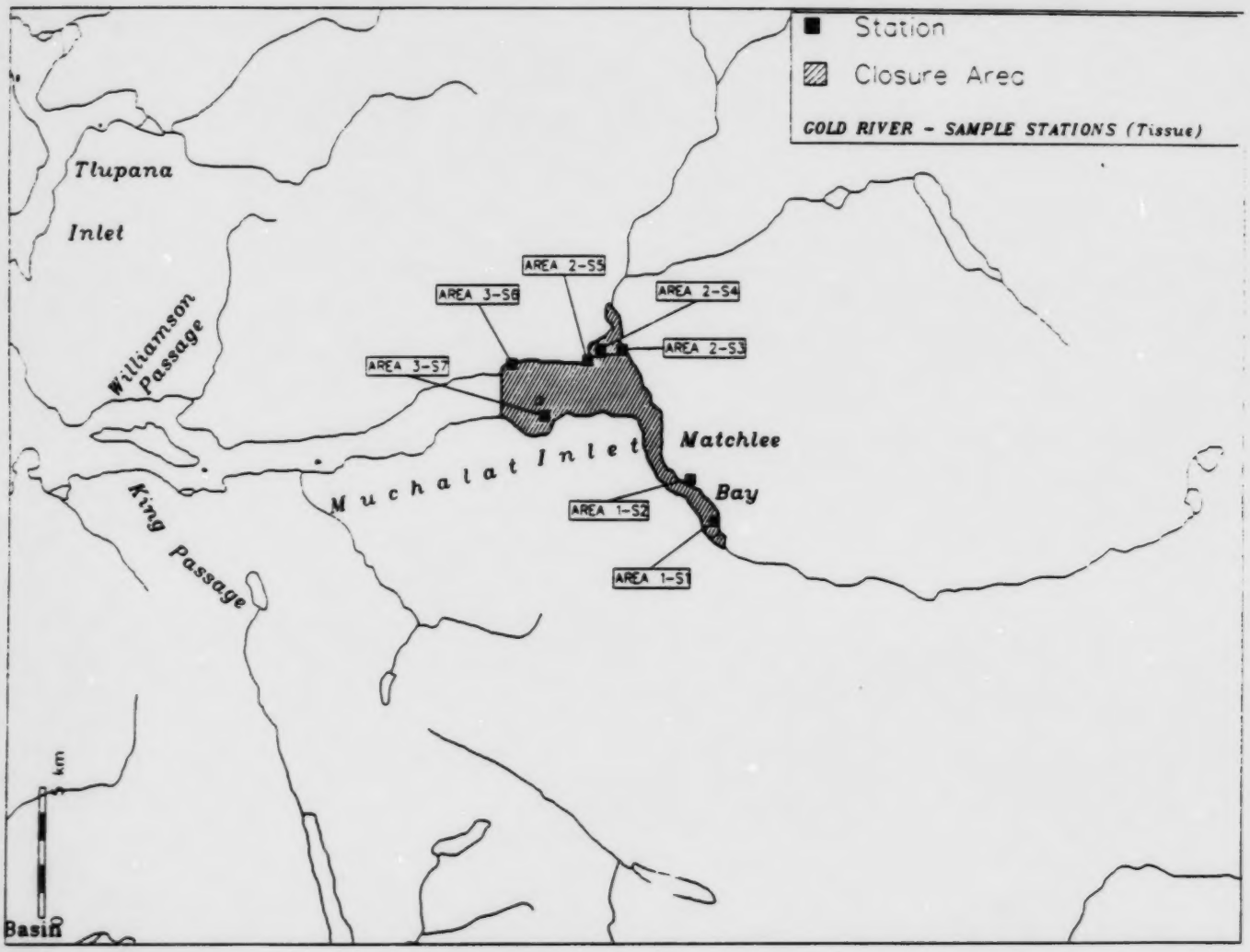

Figure 11: Tissue sampling stations at Gold River.

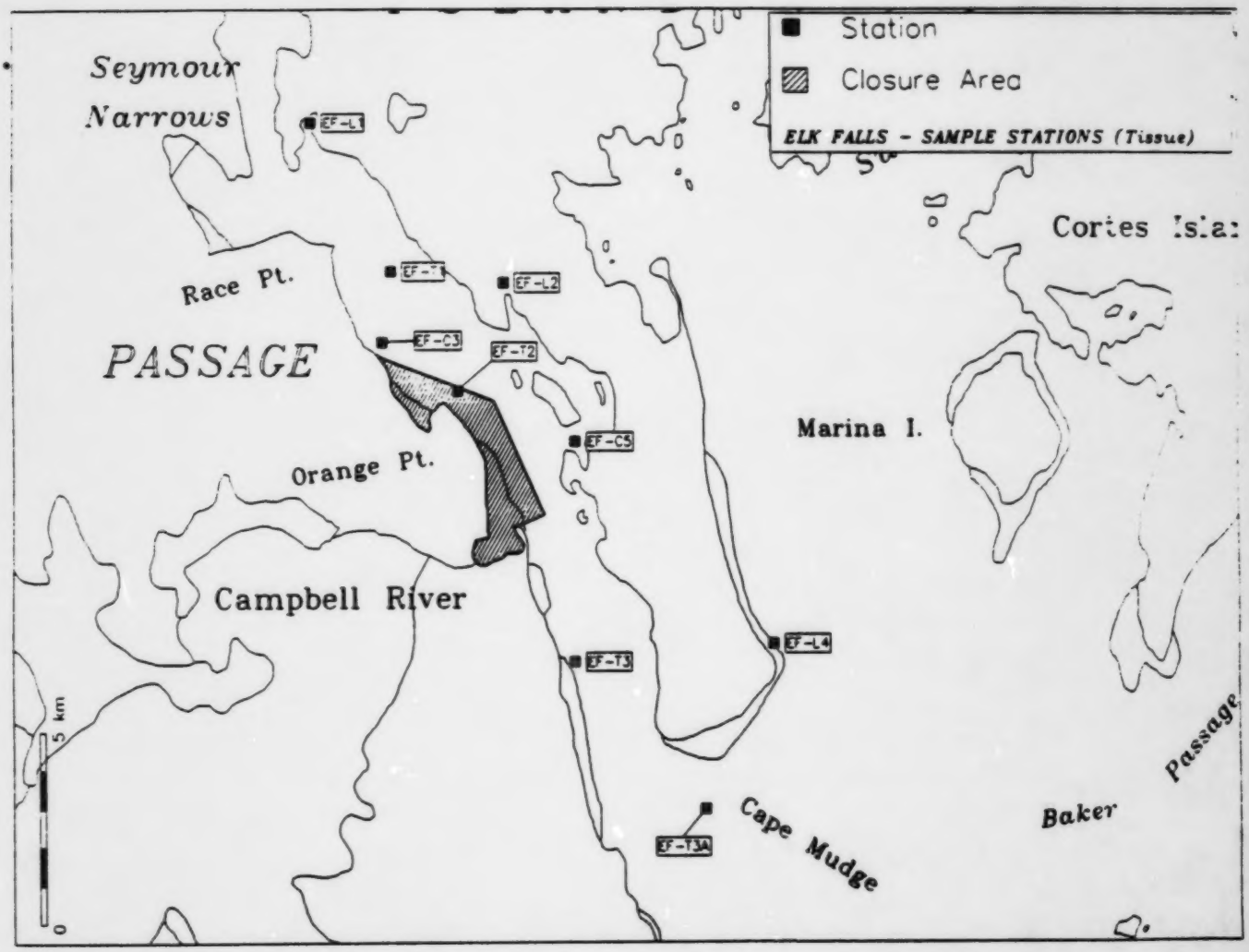

Figure 12: Tissue sampling stations at Elk Falls.

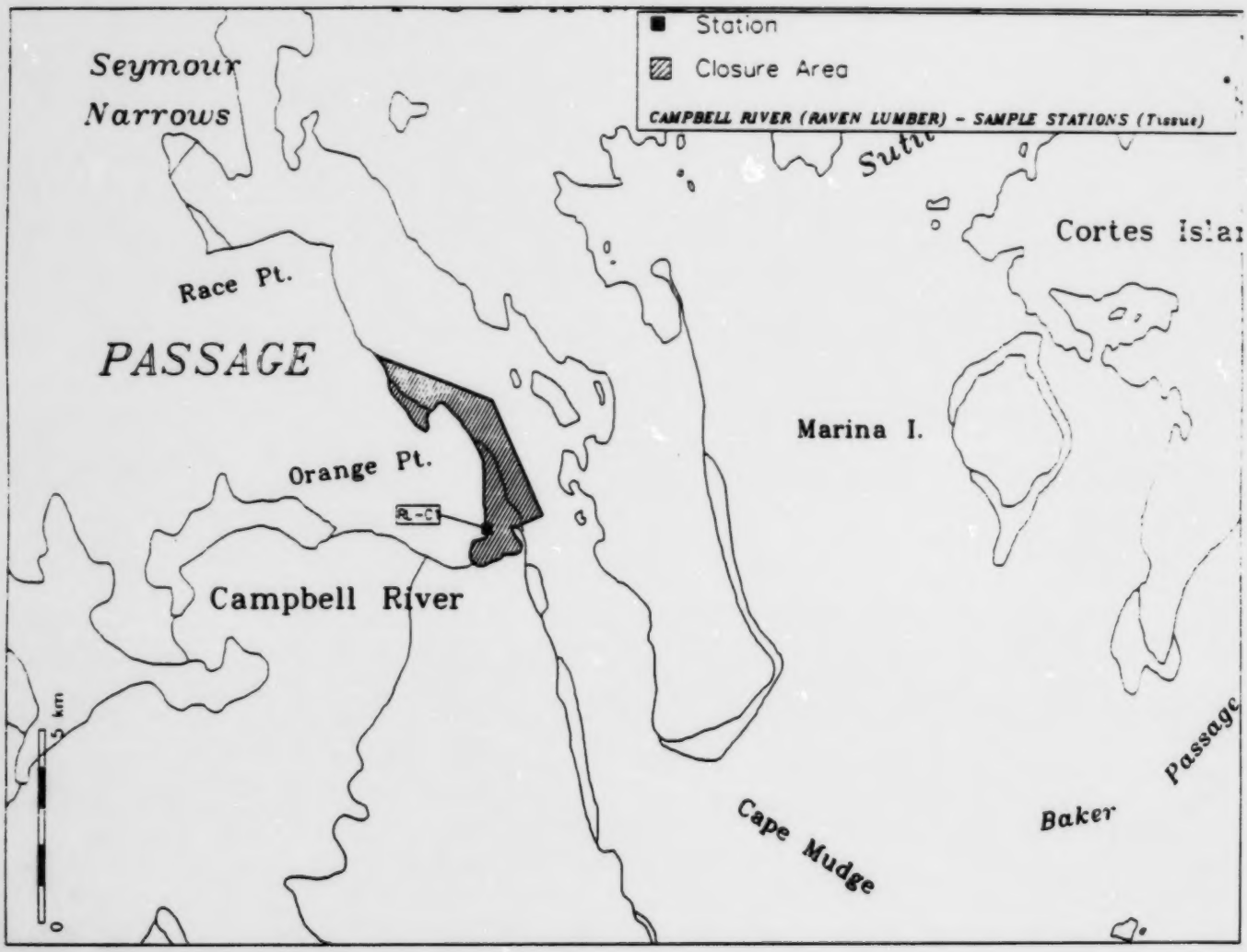

Figure 13: Tissue sampling stations at Campbell River.

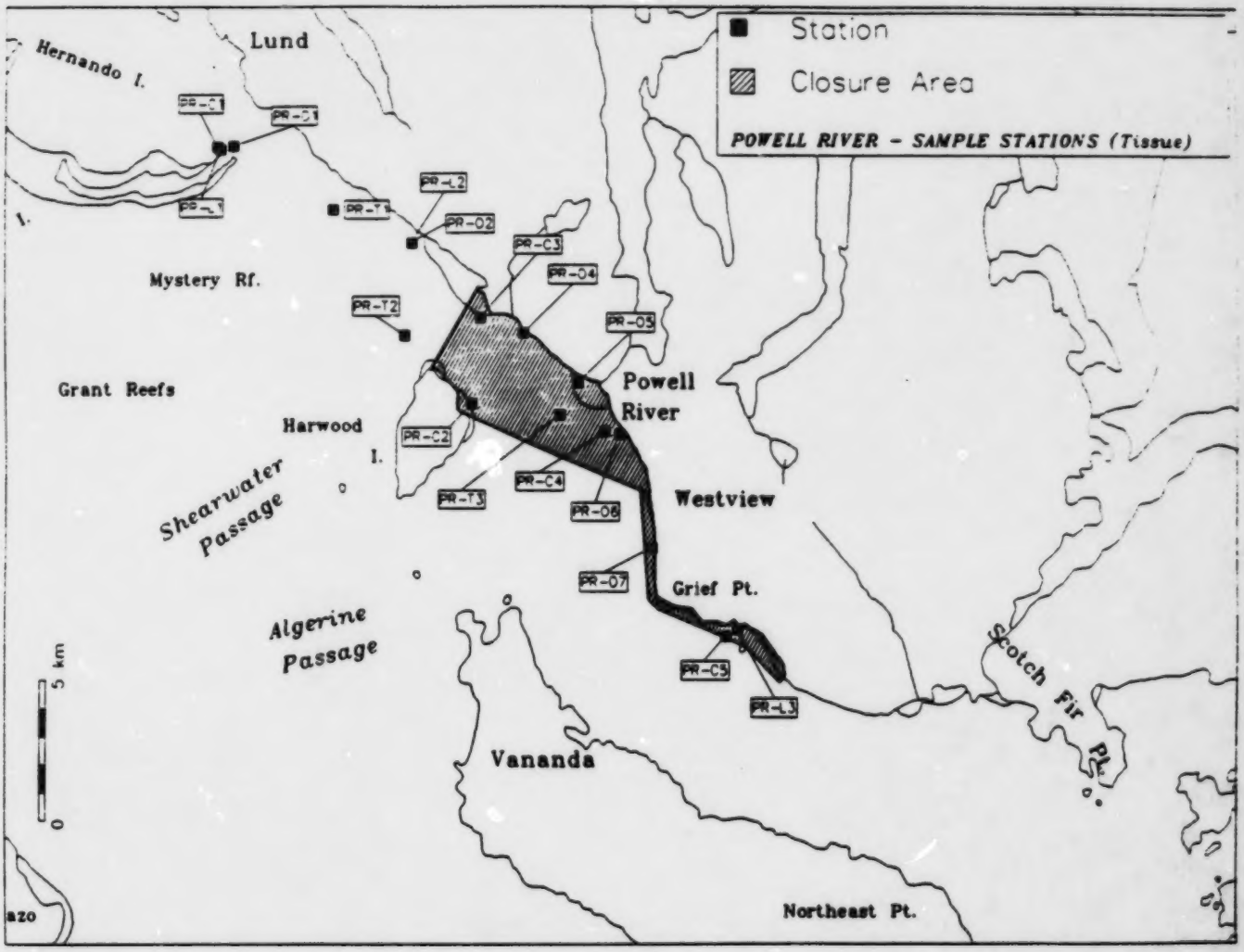

Figure 14: Tissue sampling stations at Powell River.

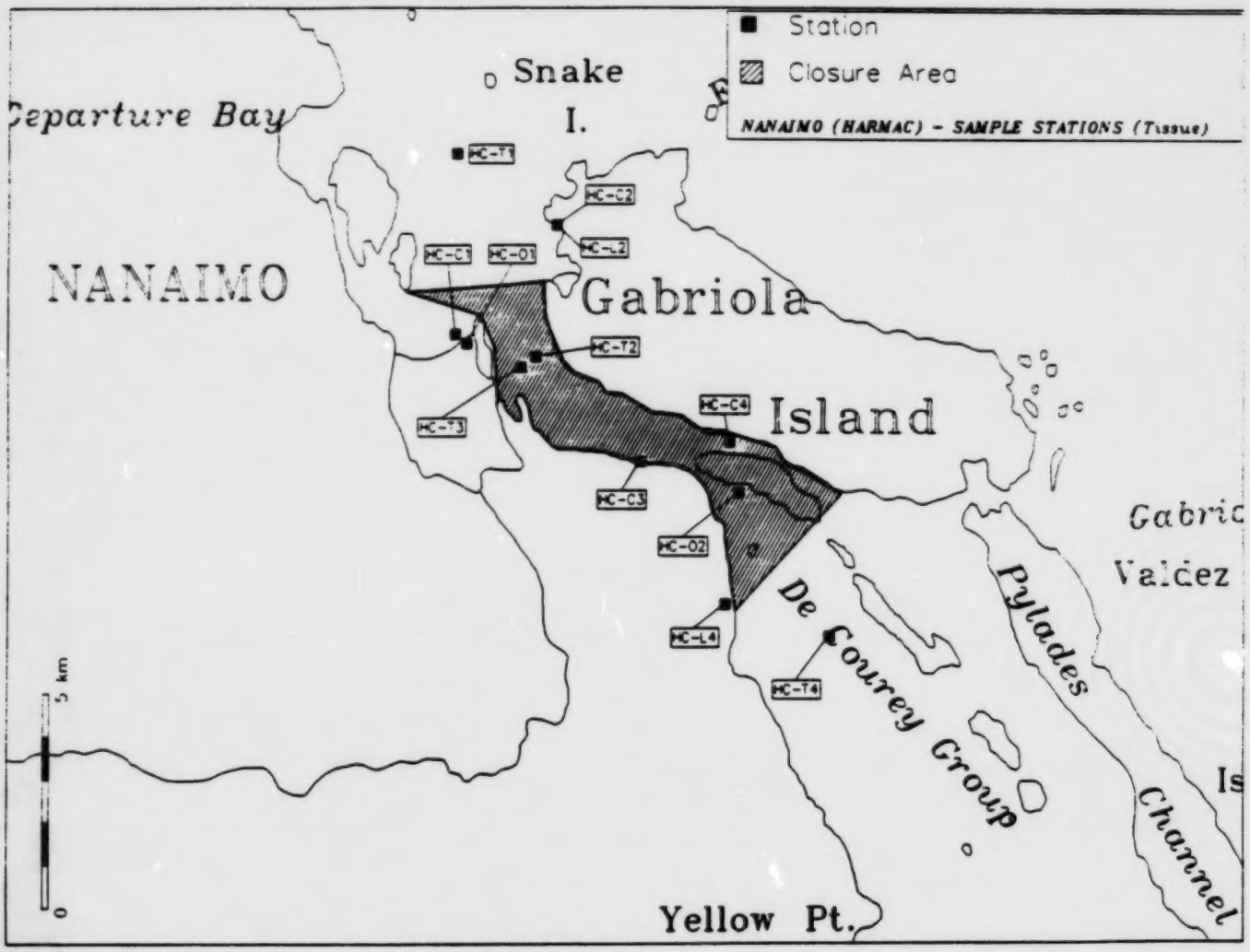

Figure 15: Tissue sampling stations at Nanaimo.

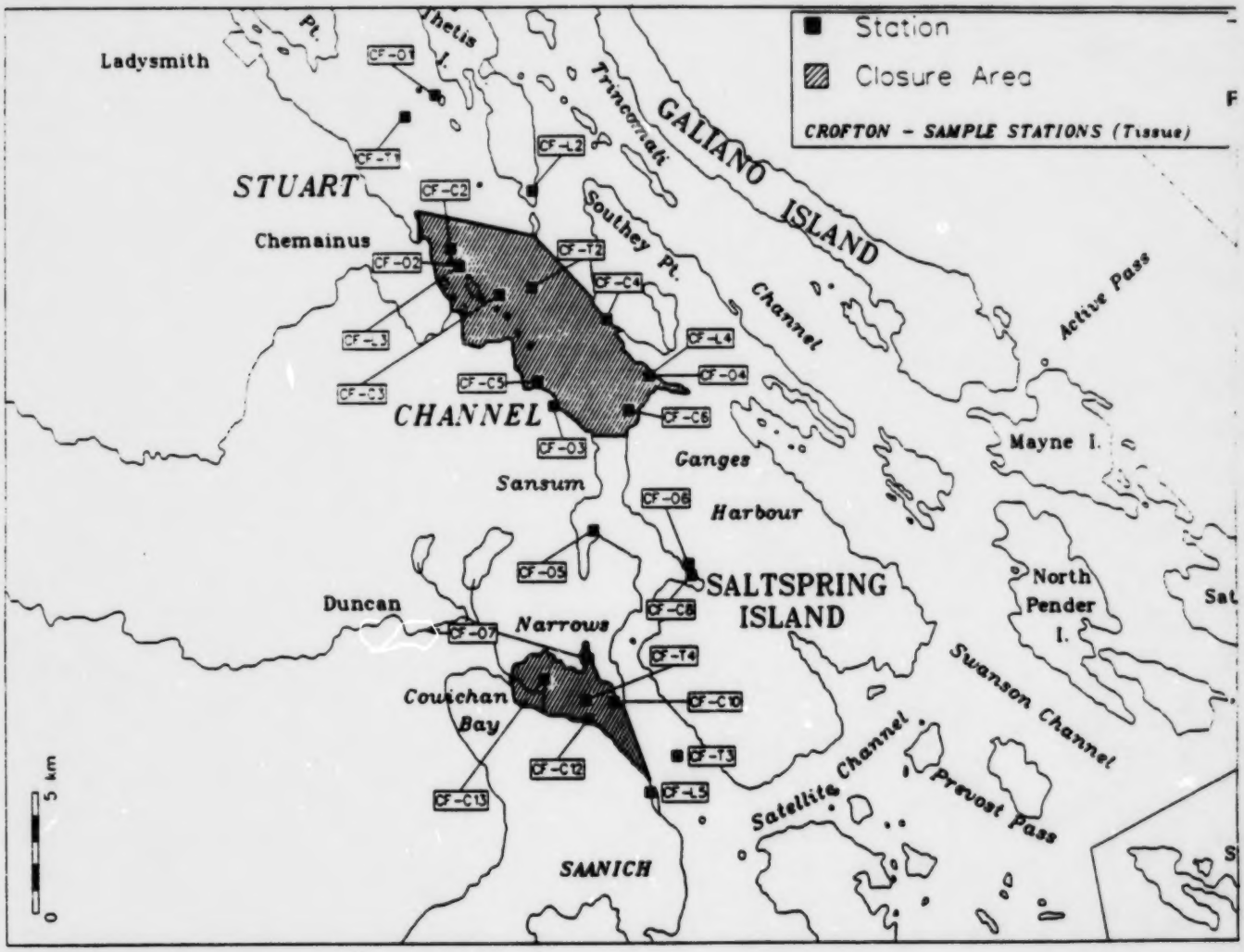

Figure 16: Tissue sampling stations at Crofton.

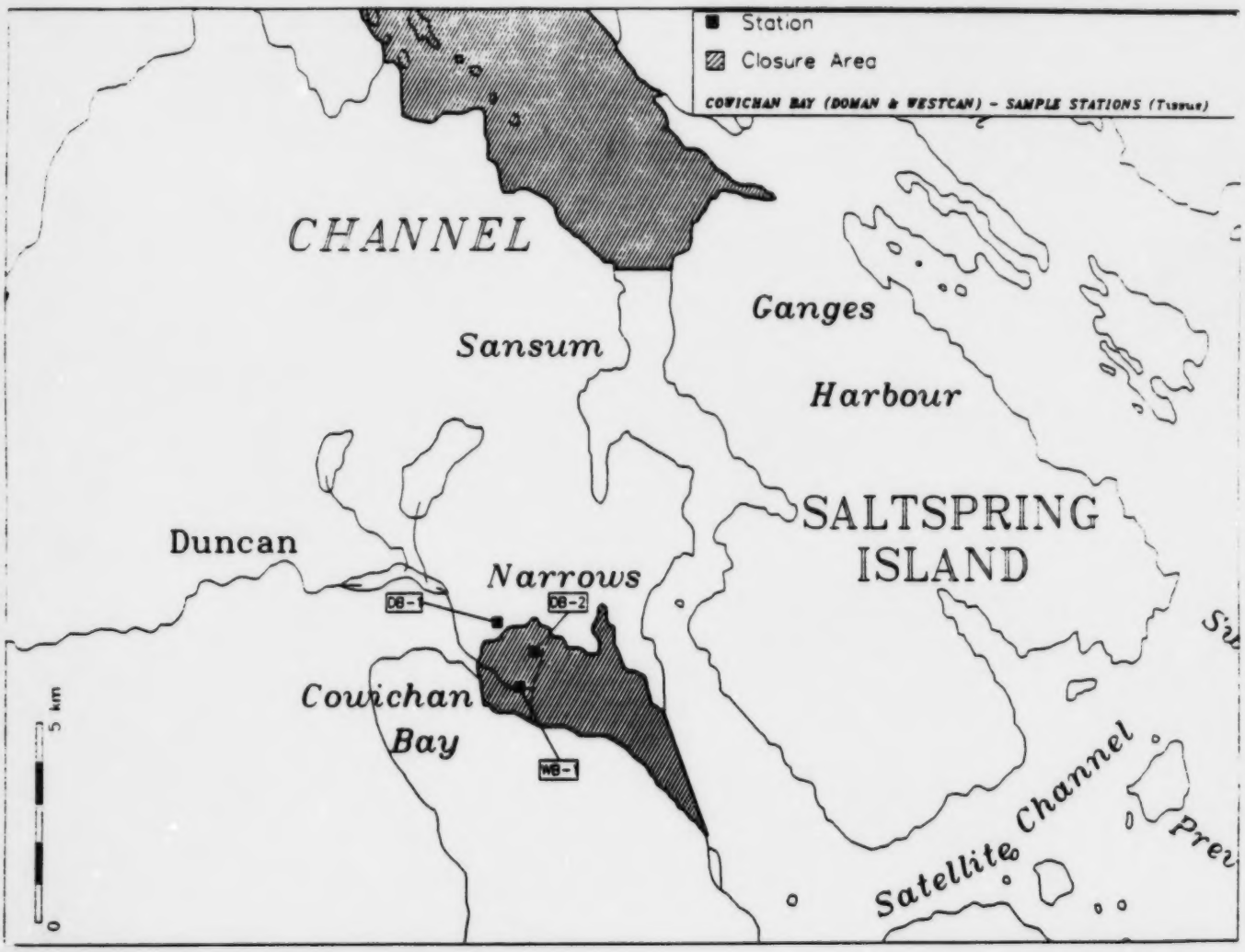

Figure 17: Tissue sampling stations at Cowichan Bay.

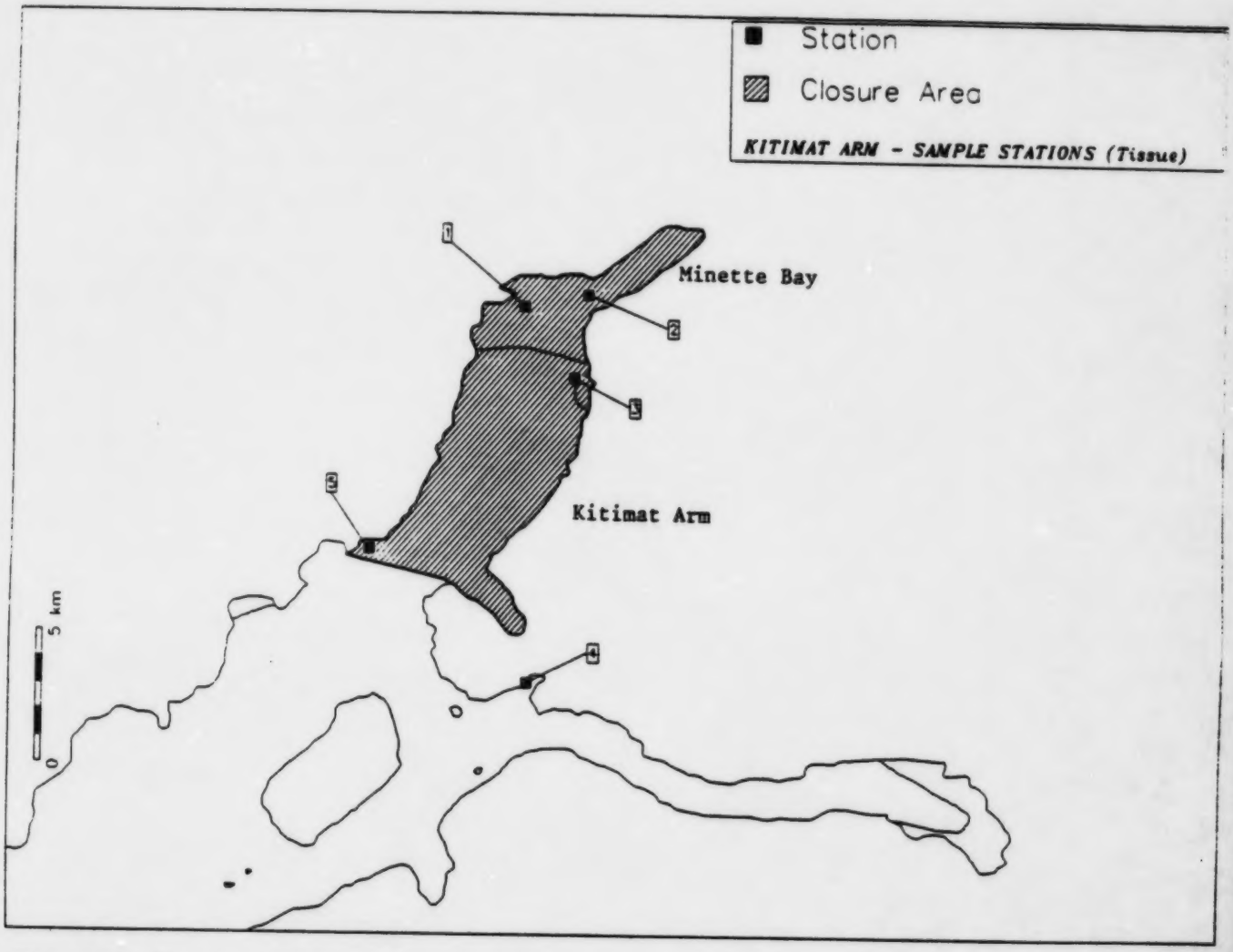

Figure 18: Tissue sampling stations at Kitimat.

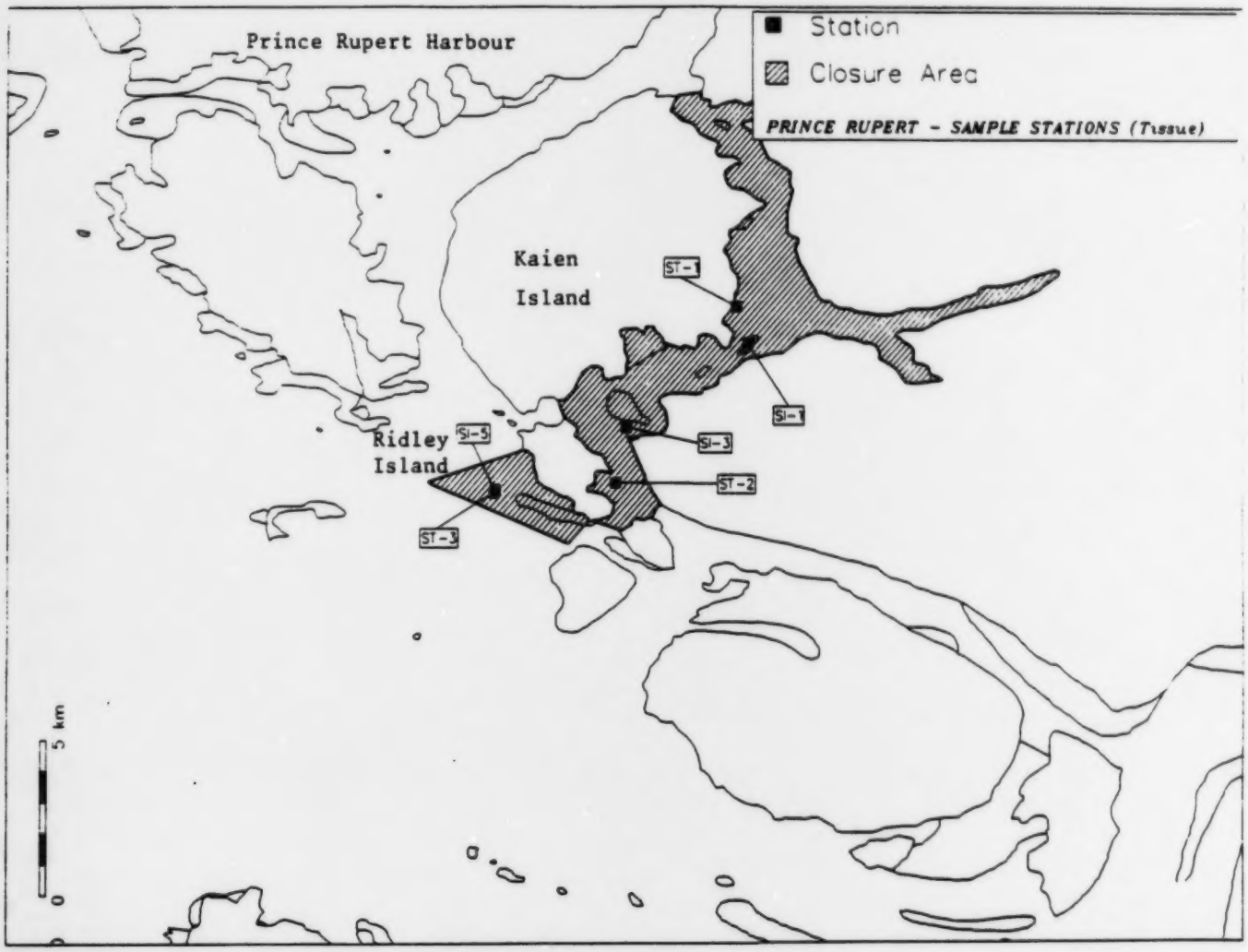

Figure 19: Tissue sampling stations at Prince Rupert.

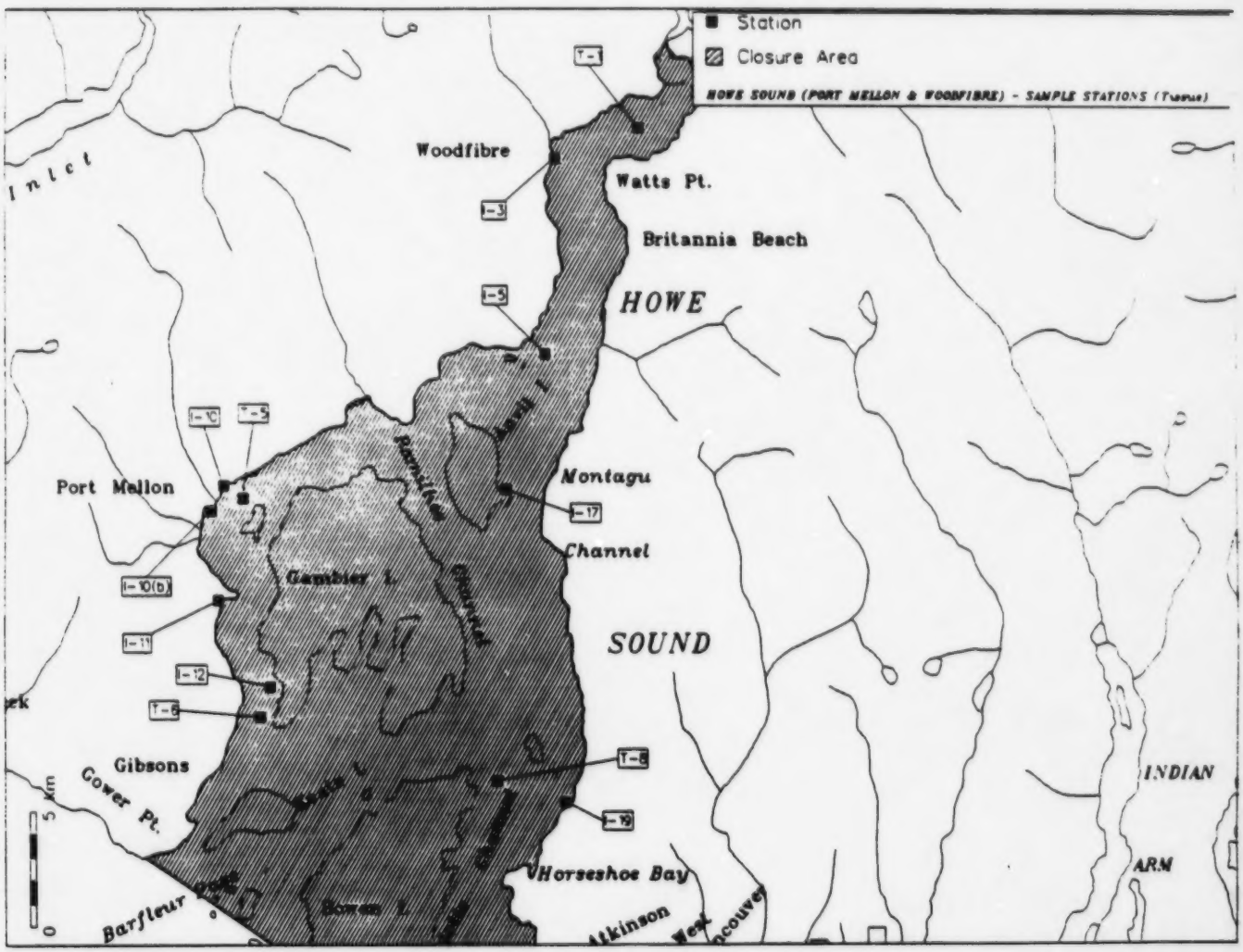

Figure 20: Tissue sampling stations at Howe Sound.

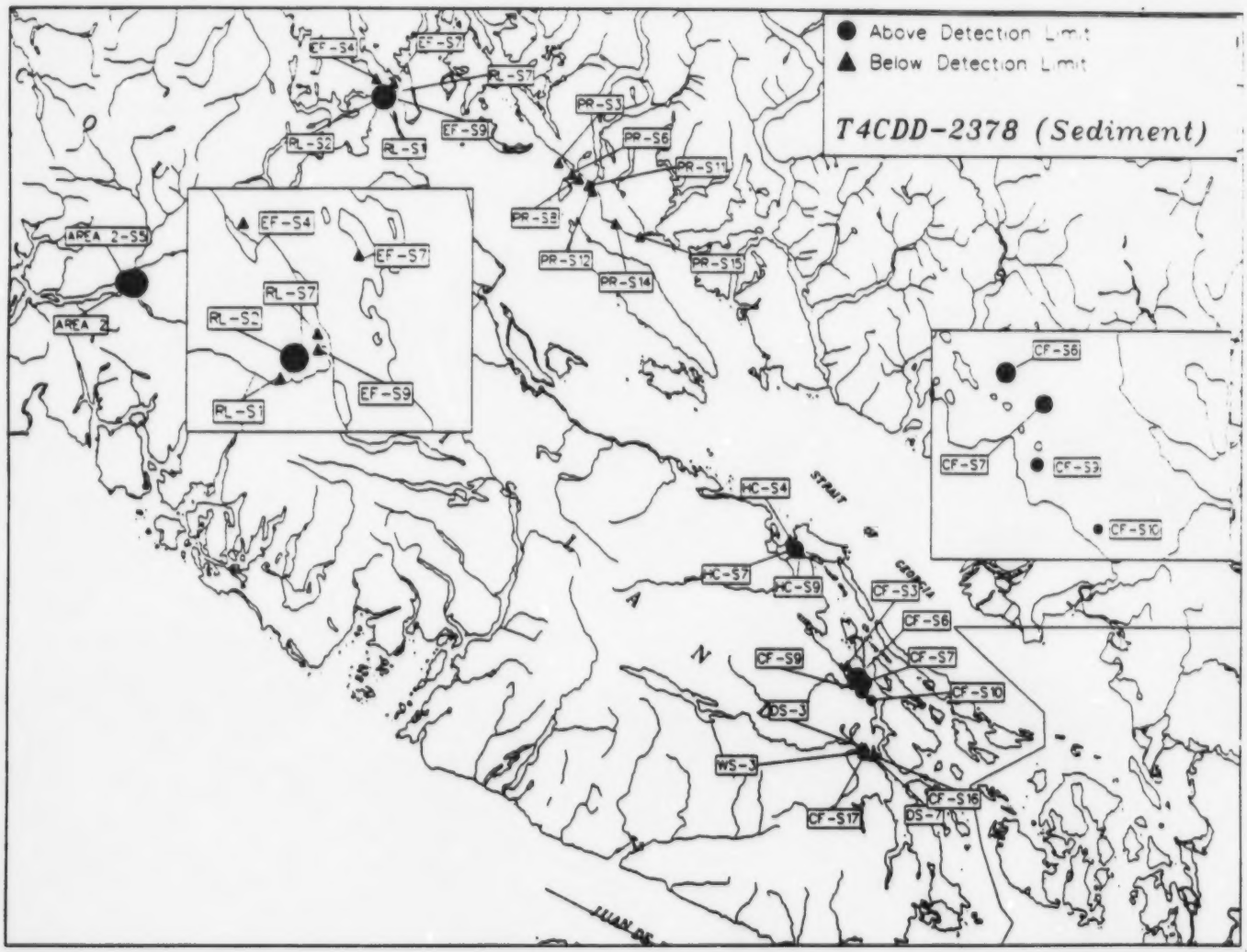

Figure 21: Relative levels of 2,3,7,8 T4CDD in Sediments.

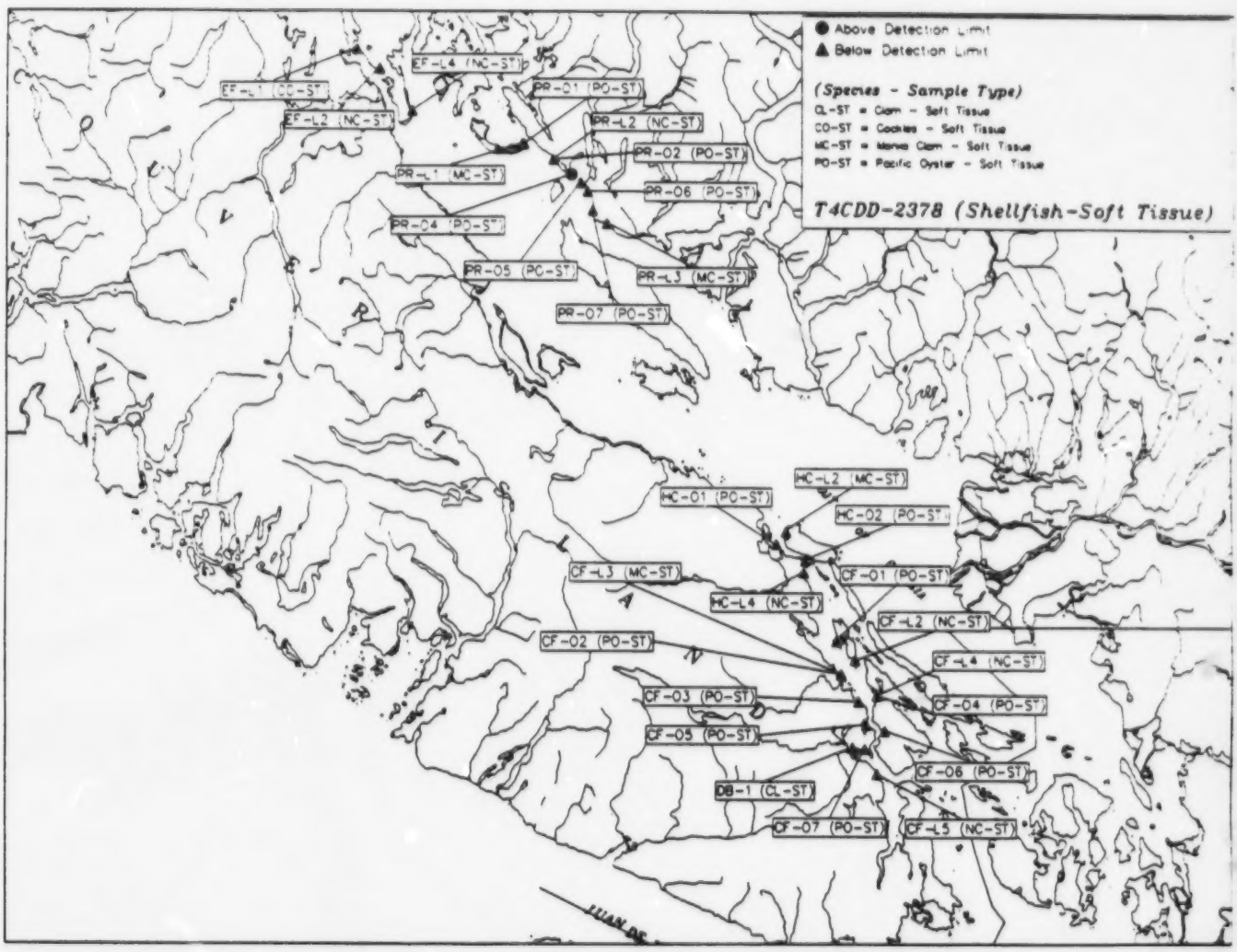

Figure 22: Relative levels of 2,3,7,8 T4CDD in bivalve Shellfish Soft Tissue.

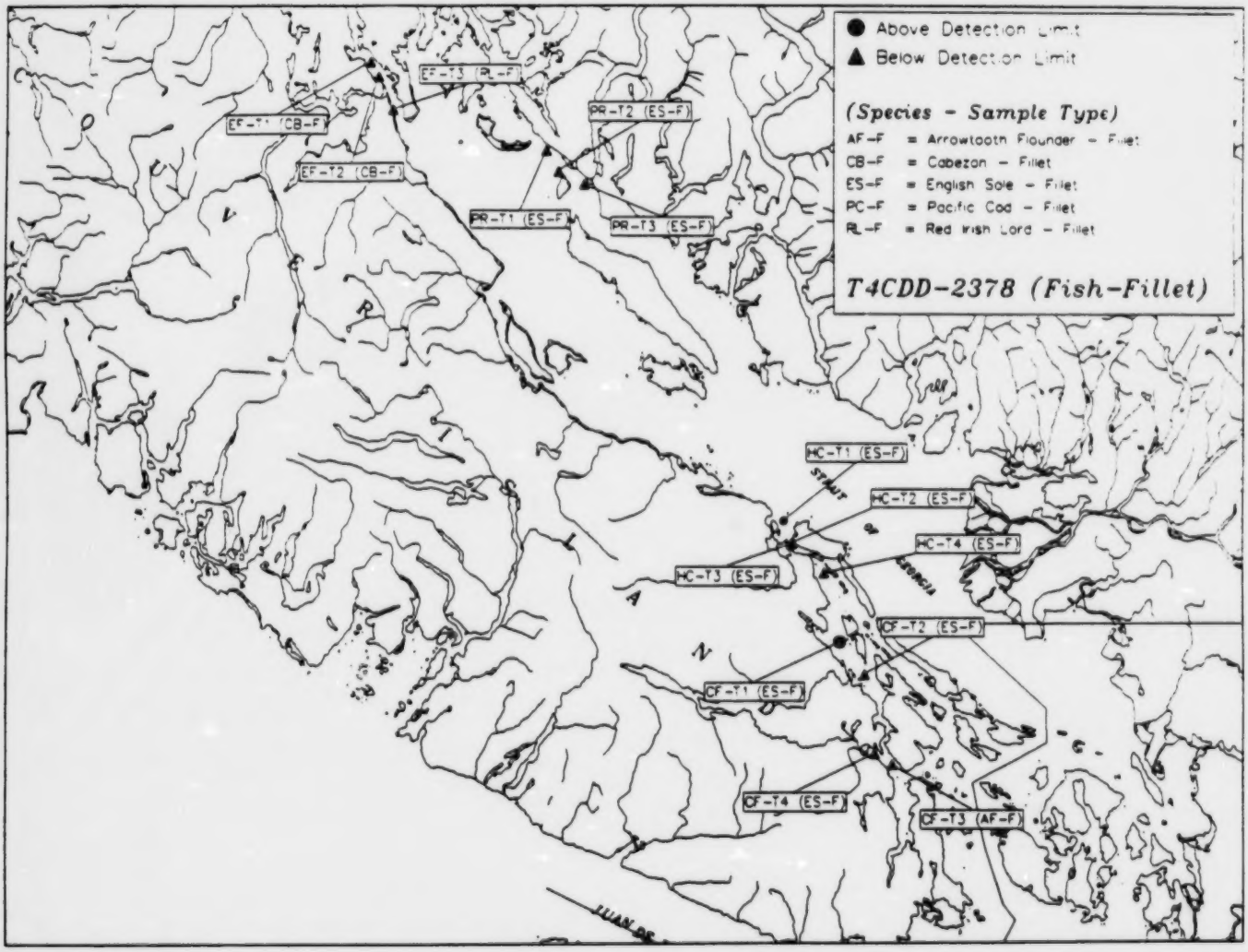

Figure 23: Relative levels of 2,3,7,8 T4CDD in fish fillets.

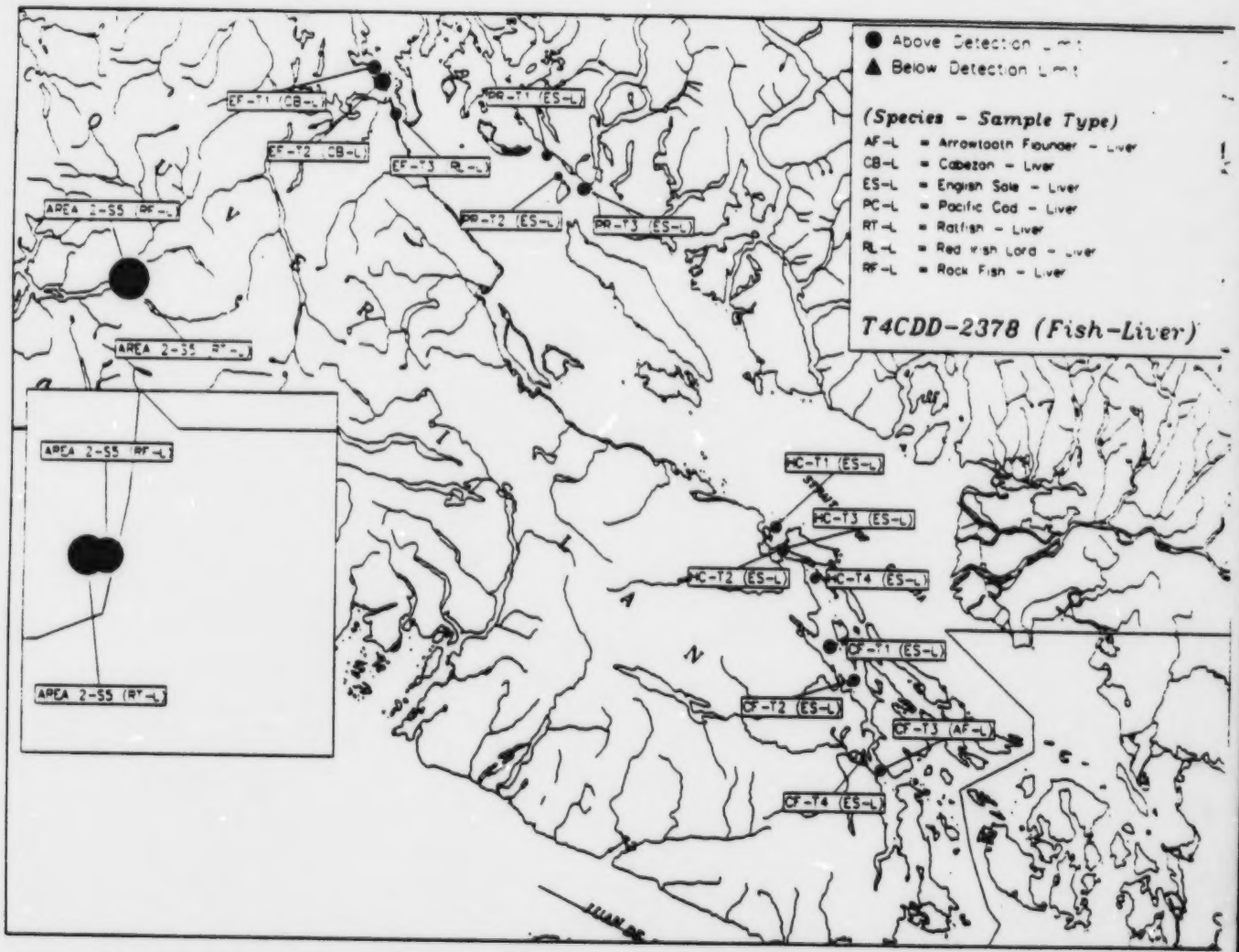

Figure 24: Relative levels of 2,3,7,8 T4CDD in fish livers.

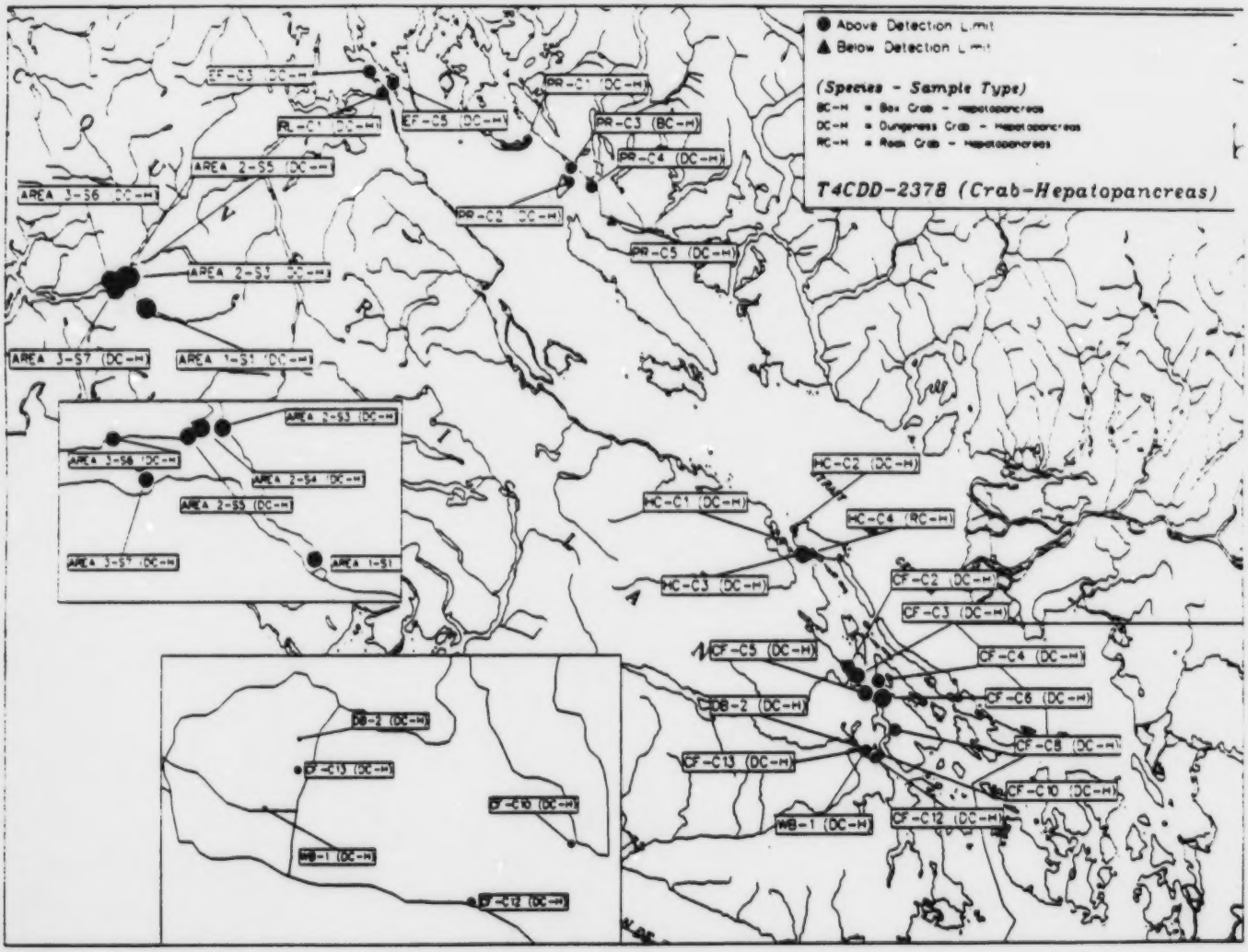

Figure 25: Relative levels of 2,3,7,8 T4CDD in crab hepatopancreas.

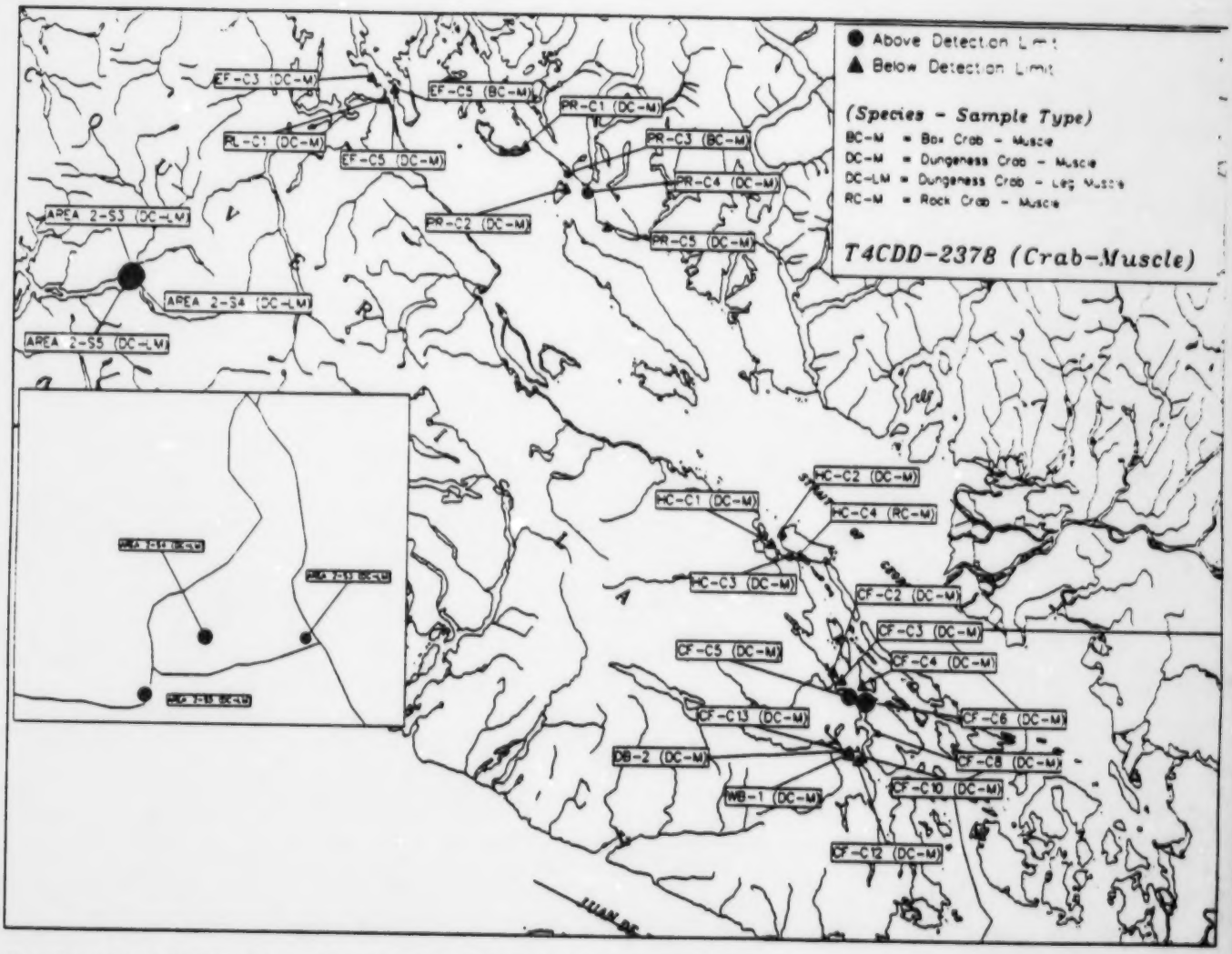

Figure 26: Relative levels of 2,3,7,8 T4CDD in crab muscle.

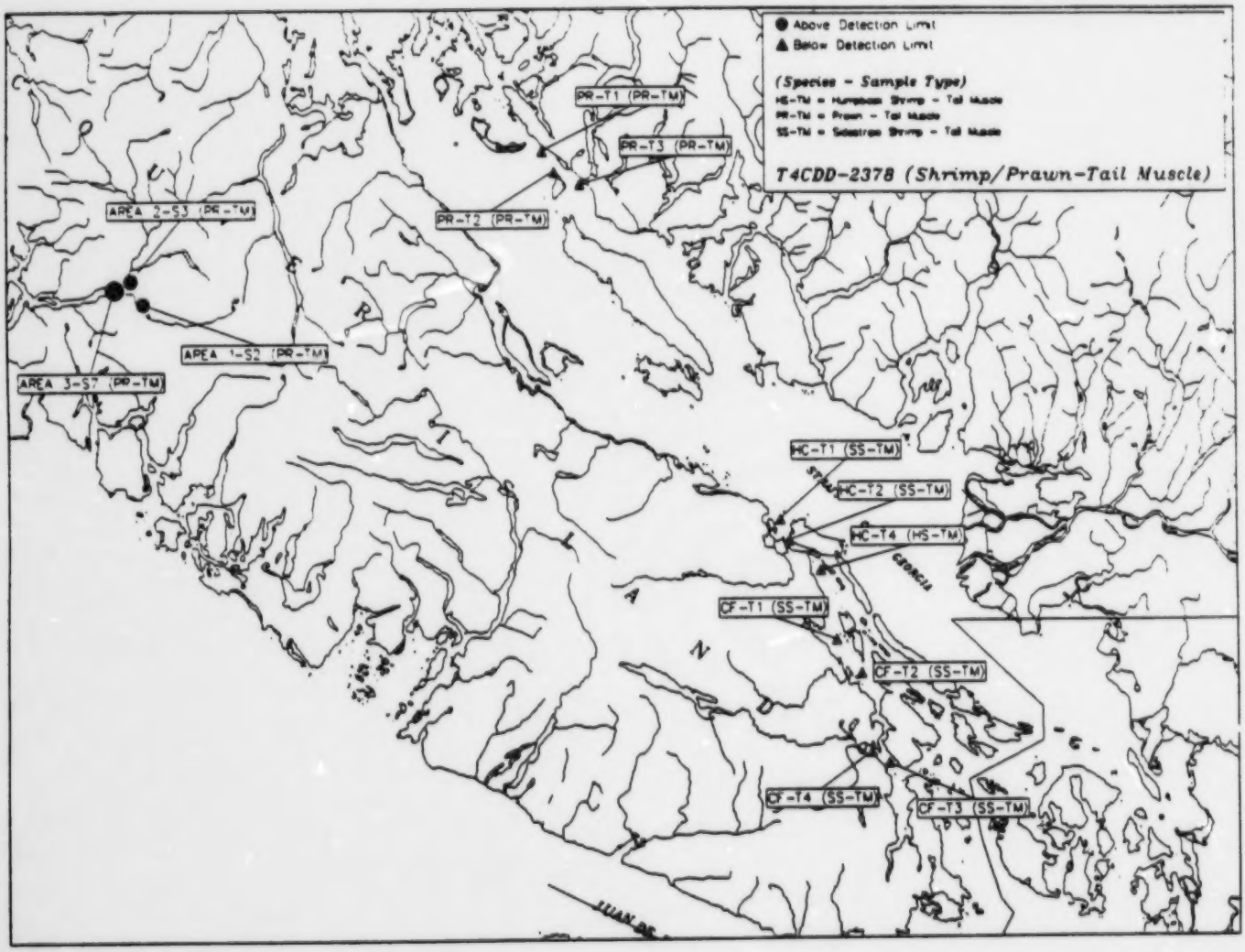

Figure 27: Relative levels of 2,3,7,8 T4CDD in shrimp and prawn tail muscle.

TABLE 1 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - COLD RIVER

SITE NO.	SITE	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
AREA 2-04	COLD RIVER - LOWER RD.	6.1	55.0	7.0	69.0	<1.6	680.0	120.0	350.0	1100.0	640.0	1200.0	17.0	<1.0	42.0	<1.4	67.0	<1.9	<1.9	19.0
AREA 2	BUCHALAT INLET - MID CR.	61.0	270.0	81.0	800.0	<3.7	11000.0	300.0	710.0	600.0	3500.0	7200.0	130.0	<2.4	300.0	<3.2	93.0	<4.0	<4.0	110.0
AREA 2-05	COLD RIVER - OUTFALL	32.0	370.0	140.0	1700.0	<5.2	15000.0	1000.0	2000.0	7500.0	3700.0	6000.0	70.0	120.0	340.0	54.0	320.0	300.0	340.0	510.0

TABLE 2 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - ELK FALLS

SITE NO.	SITE	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
EF-56	DUNCAN BAY	<1.1	5.6	<1.0	<1.0	<2.0	120.0	22.0	40.0	140.0	11.0	15.0	<1.2	<1.2	<1.2	<1.0	6.1	<3.2	<3.2	<2.9
EF-57	GOWLLAND HARBOUR	<0.7	<0.7	<1.2	<1.2	<1.2	91.0	11.0	21.0	41.0	86.0	130.0	<1.0	<1.0	1.3	<1.4	<1.4	<1.6	<1.6	<3.0
EF-59	CAMPBELL RV. - TYEE SPLIT	<1.5	<1.5	<2.9	<2.9	<2.2	21.0	6.9	12.0	50.0	5.9	8.2	<1.5	<1.5	<1.5	<2.0	<2.0	<2.7	<2.7	<5.0

TABLE 3 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - CAMPBELL RIVER (RAVEN LODGE)

SITE NO.	SITE	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123678 HCDD	TOTAL HCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HCDF	TOTAL HCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
BL-01	CAMPBELL RV.	<1.2	3.6	<1.3	<1.3	<1.1	12.0	160.0	320.0	6400.0	<0.6	<0.6	<0.8	<0.8	<0.8	<1.6	12.0	33.0	33.0	120.0
BL-02	CAMPBELL RV. - BEAR HILL	32.0	650.0	730.0	2600.0	<2.0	32000.0	17000.0	27000.0	32000.0	<3.0	140.0	<2.3	<2.3	160.0	120.0	5900.0	4300.0	13000.0	3900.0
BL-07	CAMPBELL RV. - TYEE SPIT	<1.5	<1.5	<2.9	<2.9	<2.2	21.0	6.9	12.0	50.0	5.9	8.2	<1.5	<1.5	<1.5	<2.0	<2.0	<2.7	<2.7	<5.0

TABLE 4 - [redacted] - POWELL RIVER

SITE NO.	SITE	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123478 HCDD	TOTAL HCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HCDF	TOTAL HCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
PR-S3	SEAWATER PASSAGE	<1.4	160.0	3.1	130.0	<3.4	890.0	140.0	270.0	940.0	70.0	150.0	<1.6	<1.6	19.0	3.3	90.0	55.0	130.0	67.0
PR-S5	MALASPINA STRAIT	<1.6	65.0	<3.0	40.0	<3.0	310.0	39.0	70.0	200.0	49.0	72.0	<2.0	<2.0	6.0	<2.7	14.0	12.0	42.0	12.0
PR-S8	MALASPINA STRAIT	<1.0	170.0	2.4	110.0	<1.5	390.0	59.0	120.0	410.0	120.0	200.0	<1.1	<1.1	14.0	<1.2	27.0	14.0	14.0	22.0
PR-S11	MALASPINA STRAIT	<1.7	180.0	6.7	160.0	<0.7	1100.0	140.0	260.0	650.0	240.0	360.0	2.0	<0.4	13.0	<2.3	150.0	120.0	120.0	66.0
PR-S12	MALASPINA STRAIT	<0.7	29.0	<1.6	12.0	<0.7	230.0	67.0	110.0	300.0	63.0	90.0	<0.5	2.9	2.9	<0.7	34.0	27.0	27.0	17.0
PR-S14	MALASPINA STRAIT	<0.6	<0.6	<1.7	<1.7	<0.8	2.3	0.7	9.3	46.0	1.2	1.2	<0.6	<0.6	<0.6	<0.8	<0.8	<0.8	<0.8	<1.7
PR-S15	MALASPINA STRAIT	<1.1	<1.1	<2.1	<2.1	<2.0	<2.0	<2.0	<2.0	<5.7	<0.7	<0.7	<0.9	<0.9	<0.9	<1.7	<1.7	<2.5	<2.5	<3.4

TABLE 5 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - NARAINO (NARNAC)

SITE NO.	SITE	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123678 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23678 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
NC-86	NORTHUMBERLAND CHANNEL	<7.0	190.0	31.0	380.0	<17.0	6000.0	410.0	780.0	1500.0	360.0	510.0	<11.0	<11.0	44.0	<20.0	130.0	110.0	220.0	140.0
NC-87	NORTHUMBERLAND CHANNEL	9.5	300.0	75.0	750.0	<7.0	10000.0	590.0	1100.0	1500.0	550.0	920.0	14.0	<6.6	92.0	<7.0	210.0	140.0	400.0	160.0
NC-89	NORTHUMBERLAND CHANNEL	<1.0	10.0	0.7	69.0	<2.0	720.0	46.0	85.0	130.0	51.0	82.0	<0.9	<0.9	7.0	<1.0	14.0	10.0	32.0	13.0

TABLE 6 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - CROFTON

SITE NO.	SITE	2378 TSCDD	TOTAL TSCDD	12378 PSCDD	TOTAL PSCDD	123478 HSCDD	TOTAL HSCDD	123678 HSCDD	TOTAL HSCDD	TOTAL OSCDD	2378 TSCDF	TOTAL TSCDF	12378 PSCDF	23478 PSCDF	TOTAL PSCDF	123478 HSCDF	TOTAL HSCDF	123678 HSCDF	TOTAL HSCDF	TOTAL OSCDF
CF-83	STUART CHANNEL	<5.6	<5.6	<13.0	<13.0	<0.7	250.0	<7.0	20.0	260.0	16.0	24.0	<0.6	<0.6	<0.6	<0.0	<0.0	<1.9	12.0	<9.0
CF-86	STUART CHANNEL	15.0	66.0	47.0	210.0	<1.1	4600.0	500.0	1000.0	3300.0	590.0	890.0	<1.5	<1.5	6.0	<0.9	110.0	130.0	440.0	390.0
CF-87	STUART CHANNEL	11.0	38.0	36.0	150.0	<1.9	3700.0	450.0	860.0	2100.0	410.0	650.0	<2.2	<2.2	14.0	5.2	90.0	<2.2	340.0	250.0
CF-89	OSBORN BAY	5.5	20.0	19.0	70.0	<2.0	2200.0	190.0	370.0	1000.0	210.0	310.0	<2.2	<2.2	<2.2	<2.2	30.0	40.0	110.0	84.0
CF-810	OSBORN BAY	3.0	12.0	21.0	90.0	<1.0	1200.0	110.0	200.0	710.0	97.0	150.0	<1.6	<1.6	<1.6	<1.5	27.0	21.0	60.0	49.0
CF-816	COVICHAN BAY	<3.0	<3.0	5.7	26.0	<3.9	670.0	83.0	160.0	650.0	56.0	70.0	<2.9	<2.9	<2.9	<2.3	10.0	19.0	65.0	26.0
CF-817	COVICHAN BAY	<7.9	<7.9	<7.2	<7.2	<6.1	360.0	72.0	100.0	590.0	20.0	20.0	<3.4	<3.4	<3.4	<4.5	0.0	10.0	10.0	26.0

TABLE 7 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - COVICHAN BAY (DOMAN FOREST PRODUCTS & WESTCAN TERMINALS)

SITE NO.	SITE	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123478 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
DS-1	COVICHAN BAY - BEARSHORE	<2.0	<2.0	<7.2	<7.2	<6.4	<6.4	<3.6	<3.6	11.0	<2.0	<2.0	<2.5	<2.5	<2.5	<3.5	<3.5	<3.4	8.3	<6.6
DS-7	COVICHAN BAY - BEARSHORE	<2.9	<2.9	<8.3	<8.3	<5.5	7.9	<4.1	5.4	16.9	<1.9	<1.9	<2.7	<2.7	<2.7	<3.4	<3.4	<3.9	10.0	<6.8
DS-3	COVICHAN BAY - BEARSHORE	<2.3	<2.3	<7.9	<7.9	<6.8	12.0	<3.6	8.8	55.0	<2.0	<2.0	<3.3	<3.3	<3.3	<2.5	<2.5	<3.2	10.0	8.9

TABLE 8 - DIBENZOFURAN/DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - KITIMAT ARM

SITE NO.	SITE	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123478 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
S0101	KITIMAT RV. - NOUTH NORTH	<9.7	<9.7	<16.0	<16.0	<12.0	<12.0	<16.0	<16.0	0.5	<2.4	<2.4	<3.6	<3.6	<3.6	N/A	<5.9	<12.0	<12.0	<26.0
S0201	KITIMAT RV. - NOUTH SOUTH	<4.0	<4.0	<6.6	<6.6	<13.0	<13.0	<26.0	<26.0	<29.0	<3.5	<3.5	<3.7	<3.7	<3.7	N/A	<7.1	<7.6	<7.6	<30.0

TABLE 9 - [redacted] - PRINCE RUPERT

SITE NO.	SITE	2378 PACDD	TOTAL PACDD	12378 PSCDD	TOTAL PSCDD	123478 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OBCDD	2378 TACDF	TOTAL TACDF	12378 PSCDF	23478 PSCDF	TOTAL PSCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OBCDF
SS-1	HOUSE BASIN	13.0	13.0	<3.0	<3.0	<0.3	170.0	130.0	240.0	930.0	590.0	660.0	<2.6	<2.6	6.0	<0.3	5.5	<3.0	20.0	22.0
SS-3	PORPOISE HARBOUR	0.6	0.6	<1.2	<1.2	<1.3	750.0	74.0	120.0	180.0	230.0	300.0	<0.8	<0.8	<0.8	<1.3	<1.3	<0.7	<0.7	<1.6
SS-4	PORPOISE CHANNEL	<1.0	<1.0	<0.6	<0.6	<1.2	79.0	3.0	5.0	<0.8	20.0	39.0	<0.6	<0.6	<0.6	<0.9	<0.9	<0.8	<0.8	<2.0

TABLE 10 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT) - HOWE SOUND (PORT MELLON & WOODFIBRE)

SITE NO.	SITE	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
S-2	SQUAMISH HARBOUR	<1.6	<1.6	<3.1	<3.1	<2.2	2300.0	120.0	190.0	360.0	360.0	560.0	6.5	<1.1	6.5	<1.0	4.2	5.7	17.0	<4.6
S-3	SQUAMISH HARBOUR	1.3	1.3	<2.1	<2.1	<2.0	770.0	66.0	110.0	410.0	130.0	190.0	<1.6	<1.6	<1.6	<1.2	30.0	26.0	71.0	16.0
S-3	SQUAMISH HARBOUR	1.4	1.4	<1.3	<1.3	<2.1	720.0	73.0	120.0	440.0	140.0	200.0	<1.6	<1.6	<1.6	<1.2	22.0	8.4	66.0	22.0
S-9	HOWAGH CRADEL	<1.0	<1.0	<1.5	<1.5	<2.0	280.0	42.0	76.0	480.0	52.0	69.0	<1.0	<1.0	<1.0	<1.0	6.5	10.0	44.0	<3.0
S-14	THORMBOUGH CRADEL	17.0	17.0	<6.3	<6.3	<6.0	6000.0	280.0	570.0	1500.0	1000.0	1600.0	<0.1	<0.1	<0.1	<6.3	24.0	29.0	87.0	<25.0
S-16	THORMBOUGH CRADEL	27.0	39.0	67.0	67.0	<5.9	5400.0	309.0	560.0	1500.0	850.0	1000.0	<3.0	<3.0	<3.0	13.0	62.0	60.0	130.0	33.0
S-18	THORMBOUGH CRADEL	7.5	7.5	25.0	25.0	<10.0	4300.0	130.0	290.0	980.0	300.0	610.0	<3.4	<3.4	6.5	<0.2	62.0	82.0	180.0	84.0
S-21	QUEEN CHARLOTTE CRADEL	<1.6	<1.6	<3.3	<3.3	<2.8	470.0	110.0	200.0	1300.0	77.0	100.0	<1.8	<1.8	<1.8	<1.7	50.0	46.0	130.0	36.0

TABLE II - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - GOLD RIVER

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
AREA 1-S1	DUNGENESS CRAB : HATCHLEE BAY (9.1 KM - SE)	HEPATOPANCREAS	4	3.70	49.0	49.0	35.0	79.0	<1.7	310.0	4.4	4.4	<2.5	2200.0	3000.0	27.0	56.0	120.0	<2.2	<2.2	<2.0	<2.0	<1.3
AREA 1-S2	PRAWN : HATCHLEE BAY (6.7 KM - SE)	TAIL MUSCLE	8	N/A	1.5	1.5	<1.4	<1.4	<1.1	5.4	<2.0	<2.0	<23.0	110.0	130.0	<0.5	<0.5	<0.5	<1.8	<1.8	<4.0	<4.0	<23.0
AREA 2-S3	DUNGENESS CRAB : GOLD RIVER - MOUTH (1.0 KM - ENE)	HEPATOPANCREAS	5	N/A	68.0	74.0	42.0	88.0	<1.0	450.0	6.9	9.2	<1.9	8300.0	11000.0	66.0	120.0	260.0	<1.3	<1.3	<1.0	<1.4	<1.2
AREA 2-S3	DUNGENESS CRAB : GOLD RIVER - MOUTH (1.0 KM - ENE)	LEG MUSCLE	1	N/A	2.9	2.9	1.4	1.4	<0.5	10.0	<0.8	<0.8	<2.4	350.0	380.0	3.6	4.0	7.7	<0.5	<0.5	<0.5	<0.5	<1.0
AREA 2-S3	DUNGENESS CRAB : GOLD RIVER - MOUTH (1.0 KM - ENE)	LEG MUSCLE	1	N/A	1.9	1.9	<0.8	<0.8	<0.5	3.0	<0.5	<0.5	1.7	230.0	390.0	2.2	1.9	4.6	<0.4	<0.4	<0.6	<0.6	<0.6
AREA 2-S3	DUNGENESS CRAB : GOLD RIVER - MOUTH (1.0 KM - ENE)	LEG MUSCLE	1	N/A	2.3	2.3	<2.1	<2.1	<1.5	4.9	<1.5	<1.5	<2.0	270.0	290.0	2.7	1.0	4.5	<1.0	<1.0	<2.1	<2.1	<1.0
AREA 2-S3	PRAWN : GOLD RIVER - MOUTH (1.0 KM - ENE)	TAIL MUSCLE	5	N/A	1.0	1.0	<0.8	<0.8	<2.6	5.6	<0.1	<0.1	<12.0	210.0	210.0	<1.7	<1.7	<1.7	<2.3	<2.3	<3.5	<3.5	<9.7
AREA 3-S6	DUNGENESS CRAB : MCCURDY CREEK (3.5 KM - W)	HEPATOPANCREAS	3	2.40	35.0	42.0	20.0	60.0	<1.2	300.0	2.1	4.3	<1.3	5200.0	6600.0	42.0	73.0	150.0	<0.7	<0.7	<1.6	<1.6	<1.4
AREA 3-S7	DUNGENESS CRAB : JACKLAR BAY (3.5 KM - SW)	HEPATOPANCREAS	3	N/A	40.0	56.0	31.0	72.0	<1.8	350.0	5.0	11.0	90.0	6400.0	7400.0	61.0	70.0	100.0	<1.0	<1.0	<2.4	<2.4	<4.3
AREA 2-S4	DUNGENESS CRAB : GOLD RIVER - UPPER RRR. (0.6 KM - ENE)	LEG MUSCLE	1	N/A	2.4	2.4	<0.8	<0.8	<0.6	6.5	<0.8	<0.8	<1.6	300.0	320.0	3.2	3.6	6.8	<0.5	<0.5	<0.7	<0.7	<0.9
AREA 2-S4	DUNGENESS CRAB : GOLD RIVER - UPPER RRR. (0.6 KM - ENE)	LEG MUSCLE	1	N/A	5.0	5.0	6.8	6.3	<0.3	10.0	1.0	2.4	<1.0	400.0	720.0	5.0	5.3	12.0	<0.2	<0.2	<0.4	<0.4	<0.5
AREA 2-S4	DUNGENESS CRAB : GOLD RIVER - UPPER RRR. (0.6 KM - ENE)	LEG MUSCLE	1	N/A	6.7	6.7	<1.2	<1.2	<0.5	25.0	<0.5	<0.5	<1.2	600.0	1000.0	8.1	7.3	24.0	<0.4	<0.4	<0.6	<0.6	<0.6
AREA 2-S4	DUNGENESS CRAB : GOLD RIVER - UPPER RRR. (0.6 KM - ENE)	HEPATOPANCREAS	3	N/A	100.0	110.0	48.0	110.0	<0.7	500.0	20.0	55.0	30.0	14000.0	19000.0	160.0	220.0	550.0	<0.9	16.0	2.5	2.5	<0.8

TABLE 11 (cont.) - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - COLD RIVER

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
AREA 2-S7	PRAWN : JACKSON BAY (3.5 KM - SW)	TAIL MUSCLE	10	N/A	2.7	2.7	<1.0	<1.0	<0.9	11.0	<2.9	<2.9	<10.0	210.0	250.0	<0.4	<0.4	<0.4	<0.9	<0.9	<4.0	<4.0	<9.0
AREA 2-S5	DUNGENESS CRAB : COLD RIVER - OUTFALL (0 KM)	LEG MUSCLE	1	0.20	2.6	2.6	<2.4	<2.4	<2.2	31.0	<3.0	<3.0	<23.0	380.0	590.0	3.0	4.2	12.0	<2.2	<2.2	<4.7	<4.7	<41.0
AREA 2-S5	DUNGENESS CRAB : COLD RIVER - OUTFALL (0 KM)	LEG MUSCLE	1	0.15	4.5	4.5	2.5	2.5	<0.2	17.0	0.7	0.7	<0.7	500.0	830.0	6.3	6.3	20.0	<0.2	<0.2	<0.5	<0.5	<0.4
AREA 2-S5	DUNGENESS CRAB : COLD RIVER - OUTFALL (0 KM)	LEG MUSCLE	1	0.32	3.9	3.9	2.2	2.2	<0.4	20.0	<0.5	<0.5	<1.1	470.0	680.0	6.2	6.0	21.0	<0.3	<0.3	<0.5	<0.5	<0.7
AREA 2-S5	DUNGENESS CRAB : COLD RIVER - OUTFALL (0 KM)	HEPATOPANCREAS	3	N/A	63.0	96.0	19.0	56.0	<0.5	440.0	6.7	10.0	4.2	9100.0	12000.0	81.0	120.0	310.0	<1.0	0.5	1.6	1.6	<1.2
AREA 2-S5	RATFISH : COLD RIVER - OUTFALL (0 KM)	LIVER	1	72.00	330.0	330.0	<2.2	<2.2	<2.2	<3.0	<4.0	<4.0	<17.0	50000.0	50000.0	82.0	280.0	370.0	<2.2	<2.2	<5.4	<5.4	<15.0
AREA 2-S5	ROCKFISH : COLD RIVER - OUTFALL (0 KM)	LIVER	1	N/A	150.0	150.0	19.0	19.0	<4.6	<3.0	<11.0	<11.0	<47.0	6800.0	6800.0	100.0	240.0	420.0	<4.7	23.0	<15.0	<15.0	<69.0

TABLE 12 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - ELK FALLS

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
EF-C1	DUNGENESS CRAB : DUNCAN BAY (2.0 KM - NW)	MUSCLE	2	0.55	<1.4	<1.4	<1.9	<1.9	<1.8	<1.8	<3.4	<3.4	<6.5	9.6	9.6	<1.1	<1.1	<1.1	<2.5	<2.5	<2.2	<2.2	<6.4
EF-C1	DUNGENESS CRAB : DUNCAN BAY (2.0 KM - NW)	MUSCLE	2	N/A	<0.8	<0.8	<1.5	<1.5	<2.2	<2.2	<2.5	<2.5	<7.6	12.0	12.0	<0.8	<0.8	<0.8	<2.0	<2.0	<1.6	<1.6	<7.2
EF-C1	DUNGENESS CRAB : DUNCAN BAY (2.0 KM - NW)	MUSCLE	2	N/A	<0.8	<0.8	<1.6	<1.6	<1.0	<1.0	<1.0	<1.0	<2.6	11.0	13.0	<0.6	<0.6	<0.6	<1.6	<1.6	<1.0	<1.9	<2.2
EF-C1	DUNGENESS CRAB : DUNCAN BAY (2.0 KM - NW)	HEPATOPANCREAS	6	10.40	33.0	33.0	30.0	61.0	<1.9	440.0	29.0	42.0	<7.6	650.0	740.0	4.0	12.0	20.0	<2.5	63.0	22.0	22.0	<3.7
EF-C5	DUNGENESS CRAB : COWLARD HARBOUR (4.0 KM - SE)	MUSCLE	2	1.00	<0.8	<0.8	<1.9	<1.9	<1.1	15.0	<2.0	<2.0	<4.0	31.0	37.0	<1.2	<1.2	<1.2	<1.9	<1.9	<1.2	<1.2	<2.6
EF-C5	DUNGENESS CRAB : COWLARD HARBOUR (4.0 KM - SE)	MUSCLE	2	0.80	<0.8	<0.8	<2.1	<2.1	<1.3	7.7	<1.3	<1.3	<3.2	10.0	10.0	<0.8	<0.8	<0.8	<0.8	<0.8	<0.9	<0.9	<2.6
EF-C5	BOX CRAB : COWLARD HARBOUR (4.0 KM - SE)	MUSCLE	2	N/A	<0.7	<0.7	<1.1	<1.1	<0.8	3.2	<1.3	<1.3	<2.2	4.5	5.8	<0.4	<0.4	<0.4	<1.0	<1.0	<0.8	<0.8	<1.8
EF-C5	DUNGENESS CRAB : COWLARD HARBOUR (4.0 KM - SE)	HEPATOPANCREAS	6	9.15	9.1	12.0	39.0	96.0	<1.3	660.0	15.0	25.0	14.0	720.0	910.0	7.0	13.0	44.0	<0.9	11.0	<1.6	<1.6	<1.5
EF-T1	CABEZON : DISCOVERY PASSAGE (3.0 KM - NW)	FILLET	1	0.05	<0.4	<0.4	<0.7	<0.7	<0.7	<0.7	<0.6	<0.6	<1.5	2.7	2.7	<0.3	<0.3	<0.3	<0.6	<0.6	<0.6	<0.6	<1.1
EF-T1	CABEZON : DISCOVERY PASSAGE (3.0 KM - NW)	LIVER	1	0.30	5.9	5.9	16.0	16.0	<1.4	160.0	6.0	6.0	<5.4	110.0	110.0	<0.7	3.3	3.3	<1.7	<1.7	<1.4	<1.4	<2.2
EF-T2	CABEZON : DUNCAN BAY (0.75 KM - SE)	FILLET	1	0.74	<0.5	<0.5	<1.2	<1.2	<1.0	<1.0	<1.0	<1.0	<2.2	9.0	9.0	<0.4	<0.4	<0.4	<0.9	<0.9	<1.0	<1.0	<1.3
EF-T2	CABEZON : DUNCAN BAY (0.75 KM - SE)	LIVER	1	N/A	9.9	9.9	23.0	25.0	<0.9	1100.0	39.0	39.0	18.0	950.0	950.0	41.0	39.0	120.0	<0.8	9.0	16.0	16.0	<3.4
EF-T3	RED IRISH LORD : CAMPBELL RV. (0.5 KM SSE)	FILLET	1	1.00	<0.7	<0.7	<1.1	<1.1	<1.2	<1.2	<1.1	<1.1	<3.7	1.9	1.9	<0.6	<0.6	<0.6	<1.2	<1.2	<1.5	<1.5	<2.3

TABLE 12 (cont.) - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - ELK FALLS

SITE NO.	SPECIES/SIZE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
EF-Y3	RED IRISH LORD : CAMPBELL RV. (0.5 KM - SSE)	LIVER	12	0.73	3.7	3.7	4.0	4.0	<1.3	100.0	12.0	12.0	0.6	170.0	170.0	3.1	11.0	14.0	<1.6	<1.6	<1.6	<1.6	<5.2
EF-Y3A	PACIFIC COD : CAMPBELL RV. (13.5 KM - SSE)	FILLET	1	0.99	<0.5	<0.5	<0.9	<0.9	<1.0	1.4	<0.6	<0.6	<2.2	2.8	2.8	<0.4	<0.4	<0.4	<0.8	<0.8	<0.8	<0.8	<2.5
EF-Y3A	PACIFIC COD : CAMPBELL RV. (13.5 KM - SSE)	LIVER	9	44.30	30.0	30.0	4.4	4.4	<1.0	320.0	4.7	7.5	<3.4	560.0	560.0	<0.9	<0.9	9.0	<1.1	<1.1	<0.8	<0.8	<2.2
EF-L1	COCKLES : YELLOW IS. (7.7 KM - NW)	SOFT TISSUE	4	0.84	<0.6	<0.6	<1.0	<1.0	<0.7	3.3	<0.7	<0.7	<2.1	6.1	7.6	<0.5	<0.5	<0.5	<0.9	<0.9	<1.3	<1.3	<1.3
EF-L2	NATIVE LITTLE-NECK CLAM : DISCOVERY PASSAGE (2.0 KM - NE)	SOFT TISSUE	2	1.06	<0.7	<0.7	<0.8	<0.8	<0.8	<0.8	<0.9	<0.9	<1.6	1.0	1.0	<0.5	<0.5	<0.5	<0.7	<0.7	<1.1	<1.1	<1.3
EF-L4	NATIVE LITTLE-NECK CLAM : QUADRA IS. - FRANCISCO PT (11.5 KM - SE)	SOFT TISSUE	30	1.26	<0.6	<0.6	<0.9	<0.9	<0.8	<0.8	<0.4	<2.4	<1.9	1.6	1.6	<0.5	<0.5	<0.5	<1.0	<1.0	<1.0	<1.0	<1.7

TABLE 13 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - CAMPBELL RIVER (RAVEN LUMBER)

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
BL-C1	DUNGENESS CRAB : BAKER SLOUGH (0.75 KM - DOC)	MUSCLE	1	N/A	<0.5	<0.5	<1.3	<1.3	<0.8	4.9	<1.1	<1.1	<2.3	5.6	5.6	<0.4	<0.4	<0.4	<1.0	5.4	<1.6	<1.6	<1.8
BL-C1	DUNGENESS CRAB : BAKER SLOUGH (0.75 KM - DOC)	HEPATOPANCREAS	1	N/A	12.0	19.0	32.0	92.0	220.0	670.0	200.0	200.0	110.0	540.0	740.0	9.1	18.0	560.0	14.0	880.0	210.0	670.0	42.0

TABLE 14 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - POWELL RIVER

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
PR-C1	DUNGENESS CRAB : SAVARY ISLAND - HACE PT (13.3 KM - NW)	MUSCLE	2	0.69	<0.4	<0.4	<0.7	<0.7	<0.7	<0.7	<0.5	<0.5	<1.5	4.1	4.6	<0.4	<0.4	<0.4	<1.5	<1.5	<0.6	<0.6	<1.7
PR-C1	DUNGENESS CRAB : SAVARY ISLAND - HACE PT (13.3 KM - NW)	MUSCLE	2	0.77	<0.8	<0.8	<1.2	<1.2	<0.8	<0.8	<1.9	<1.9	<2.5	2.6	2.6	<0.6	<0.6	<0.6	<1.2	<1.2	<1.4	<1.4	<1.7
PR-C1	DUNGENESS CRAB : SAVARY ISLAND - HACE PT (13.3 KM - NW)	MUSCLE	2	0.74	<0.8	<0.8	<1.2	<1.2	<0.9	<0.9	<0.9	<0.9	<2.0	0.2	0.2	<0.7	<0.7	<0.7	<1.1	<1.1	<1.0	<1.0	<1.9
PR-C1	DUNGENESS CRAB : SAVARY ISLAND - HACE PT (13.3 KM - NW)	HEPATOPANCREAS	6	11.00	4.7	4.7	9.2	10.0	<1.0	77.0	3.1	5.6	<2.0	270.0	330.0	<0.8	3.2	10.0	<1.3	<1.3	<1.9	<1.9	<3.9
PR-C2	DUNGENESS CRAB : HARWOOD IS. - EAST (2.9 KM - W)	MUSCLE	2	0.92	<0.4	<0.4	<0.5	<0.5	<0.5	<0.5	<0.4	<0.4	<1.6	11.0	13.0	<0.2	<0.2	<0.2	<0.6	<0.6	<1.1	<1.1	<3.0
PR-C2	DUNGENESS CRAB : HARWOOD IS. - EAST (2.9 KM - W)	MUSCLE	2	0.82	<0.6	<0.6	<1.3	<1.3	<1.3	<1.3	<2.5	<2.5	<2.1	6.1	7.3	<0.5	<0.5	<0.5	<1.5	<1.5	<2.5	<2.5	<1.8
PR-C2	DUNGENESS CRAB : HARWOOD IS. - EAST (2.9 KM - W)	MUSCLE	2	0.90	<1.1	<1.1	<1.2	<1.2	<1.0	<1.0	<1.3	<1.3	<2.2	4.6	5.3	<0.4	<0.4	<0.4	<0.9	<0.9	<1.4	<1.4	<2.4
PR-C2	DUNGENESS CRAB : HARWOOD IS. - EAST (2.9 KM - W)	HEPATOPANCREAS	6	10.70	6.3	7.5	5.5	8.6	<1.5	25.0	1.0	1.0	<2.4	510.0	630.0	<0.7	5.1	12.0	<1.1	3.1	2.9	2.9	<1.6
PR-C3	BOX CRAB : SCUTTLE BAY (3.5 KM - NW)	MUSCLE	2	0.71	<0.6	<0.6	<1.1	<1.1	<1.0	<1.0	<0.6	<0.6	<2.2	13.0	15.0	<0.6	<0.6	<0.6	<1.0	<1.0	<0.7	<0.7	<1.6
PR-C3	BOX CRAB : SCUTTLE BAY (3.5 KM - NW)	MUSCLE	2	1.17	0.7	0.7	<0.8	<0.8	<1.0	5.9	<0.6	<0.6	<1.8	50.0	60.0	<0.3	<0.3	<0.3	<1.1	<1.1	<0.6	<0.6	<1.4
PR-C3	BOX CRAB : SCUTTLE BAY (3.5 KM - NW)	HEPATOPANCREAS	6	7.07	0.9	0.9	9.5	20.0	<1.3	240.0	9.2	14.0	7.0	1100.0	1300.0	<0.8	0.8	11.0	<1.0	13.0	<1.0	<1.0	<0.9
PR-C4	[illegible] : MALASPINA STRAIT (1.7 KM - SE)	MUSCLE	2	0.68	1.1	1.1	1.7	1.7	<1.6	16.0	<0.9	<0.9	<0.9	120.0	140.0	<0.6	<0.6	<0.6	<1.3	<1.3	<1.0	<1.0	<2.0
PR-C4	DUNGENESS CRAB : MALASPINA STRAIT (1.7 KM - SE)	MUSCLE	2	0.72	1.2	1.2	<1.0	<1.0	<2.4	13.0	<2.9	<2.9	<9.1	120.0	150.0	<0.7	<0.7	<0.7	<2.0	<2.0	<1.7	<1.7	<4.5

TABLE 14 (cont.) - [illegible] RESULTS (PPT WET WEIGHT) - POWELL RIVER

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
PB-C4	DUNGENESS CRAB : MALASPINA STRAIT (1.7 KM - SE)	MUSCLE	2	0.78	1.2	1.2	<2.0	<2.0	<1.8	9.2	<2.1	<2.1	<5.5	110.0	150.0	<0.7	0.8	0.8	<1.5	<1.5	<2.2	<2.2	<2.5
PB-C4	DUNGENESS CRAB : MALASPINA STRAIT (1.7 KM - SE)	HEPATOPANCREAS	6	2.96	9.7	9.7	5.9	5.9	<4.5	92.0	<12.0	<12.0	<10.0	930.0	1100.0	<2.3	8.2	8.2	<3.7	17.0	<6.3	<6.3	<6.2
PB-C5	DUNGENESS CRAB : MALASPINA STRAIT (0.3 KM - SSE)	MUSCLE	2	0.88	<0.5	<0.5	<1.3	<1.3	<1.4	<1.4	<1.8	<1.8	<5.7	11.0	13.0	<0.5	<0.5	<0.5	<1.1	<1.1	<2.2	<2.2	<2.6
PB-C5	DUNGENESS CRAB : MALASPINA STRAIT (0.3 KM - SSE)	MUSCLE	2	0.88	<0.6	<0.6	<1.4	<1.4	<1.4	<1.4	<2.6	<2.6	<9.6	11.0	11.0	<0.7	<0.7	<0.7	<1.2	<1.2	<2.7	<2.7	<6.6
PB-C5	DUNGENESS CRAB : MALASPINA STRAIT (0.3 KM - SSE)	MUSCLE	2	N/A	<0.7	<0.7	<0.9	<0.9	<1.7	<1.7	<3.6	<3.6	<6.4	7.3	8.3	<0.6	<0.6	<0.6	<1.8	<1.8	<0.2	<0.2	<5.6
PB-C5	DUNGENESS CRAB : MALASPINA STRAIT (0.3 KM - SSE)	HEPATOPANCREAS	6	6.41	<0.7	<0.7	2.0	5.5	<2.2	29.0	5.7	5.7	<4.6	190.0	220.0	<0.7	2.0	5.0	<2.1	<2.1	<2.8	<2.8	<3.7
PB-T1	ENGLISH SOLE : SHEARWATER PASSAGE (7.0 KM - NW)	FILLET	1	1.37	<0.5	<0.5	<1.1	<1.1	<1.2	<1.2	<1.2	<1.2	<2.2	4.0	4.0	<0.3	<0.3	<0.3	<1.1	<1.1	<1.3	<1.3	<1.8
PB-T1	ENGLISH SOLE : SHEARWATER PASSAGE (7.0 KM - NW)	LIVER	12	6.56	2.7	2.7	9.2	9.2	<6.9	120.0	<5.7	<5.7	<8.0	130.0	130.0	<2.3	6.1	6.1	<11.0	<11.0	<5.2	<5.2	<13.0
PB-T2	ENGLISH SOLE : SHEARWATER PASSAGE (5.5 KM - NW)	FILLET	1	1.38	<0.4	<0.4	<0.7	<0.7	<0.5	1.6	<1.0	<1.0	<1.0	0.7	0.7	<0.3	<0.3	<0.3	<0.5	<0.5	<0.7	<0.7	<0.7
PB-T2	ENGLISH SOLE : SHEARWATER PASSAGE (5.5 KM - NW)	LIVER	11	5.30	1.0	1.0	4.9	4.9	<2.0	<3.0	4.0	4.0	5.7	71.0	71.0	<1.1	4.1	4.1	<1.5	<1.5	<2.2	<2.2	<1.8
PB-T3	ENGLISH SOLE : MALASPINA STRAIT (0.3 KM - SSW)	FILLET	1	N/A	<0.7	<0.7	<1.1	<1.1	<1.5	2.4	<3.4	<3.4	<12.0	30.0	30.0	<0.7	<0.7	<0.7	<2.1	<2.1	<3.6	<3.6	<7.6
PB-T3	ENGLISH SOLE : MALASPINA STRAIT (0.3 KM - SSW)	LIVER	12	5.20	6.9	6.9	9.5	9.5	<3.1	130.0	15.0	15.0	15.0	210.0	210.0	2.0	17.0	19.0	<1.2	2.4	<1.2	<1.2	<2.9
PB-T3	PRAWN : SHEARWATER PASSAGE (7.0 KM - NW)	TAIL MUSCLE	10	N/A	<0.6	<0.6	<1.0	<1.0	<1.6	4.5	<1.7	<1.7	<2.2	14.0	14.0	<0.5	<0.5	<0.5	<1.0	<1.0	<1.1	<1.1	<1.0

TABLE 14 (cont.) - DIOXIN/FURAN ANALYSIS RESULTS (PPT WET WEIGHT) - POWELL RIVER

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
PR-T2	PRAWN : SAGAWATER PASSAGE (5.5 KM - NW)	TAIL MUSCLE	2	N/A	<1.1	<1.1	<1.5	<1.5	<2.2	2.6	<2.1	<2.1	<3.2	15.0	15.0	<0.8	<0.8	<0.8	<1.9	<1.9	<2.6	<2.6	<1.7
PR-T3	PRAWN : MALASPINA STRAIT (0.3 KM - SSW)	TAIL MUSCLE	10	1.52	<0.7	<0.7	<1.5	<1.5	<1.3	4.6	<3.6	<3.6	<7.9	16.0	16.0	<0.6	<0.6	<0.6	<1.3	<1.3	<2.6	<2.6	<0.8
PR-L1 *	MANILA CLAM : SAVARY ISLAND - RACE PT (13.3 KM - NW)	SOFT TISSUE	26	1.07	<0.6	<0.6	<1.2	<1.2	<0.8	<0.8	<0.7	<0.7	<0.9	2.0	2.5	<0.5	<0.5	<0.5	<0.9	<0.9	<0.9	<0.9	<0.8
PR-L2	NATIVE LITTLE-NECK CLAM : SCUTTLE BAY (6.5 KM - NW)	SOFT TISSUE	20	1.20	<0.4	<0.4	<1.3	<1.3	<0.8	<0.8	<0.9	<0.9	<1.2	12.0	14.0	<0.5	<0.5	<0.5	<0.8	<0.8	<1.0	<1.0	<0.9
PR-L3	MANILA CLAM : MALASPINA STRAIT (0.3 KM - SSE)	SOFT TISSUE	40	1.20	<0.5	<0.5	<0.8	<0.8	<1.0	<1.0	<1.6	<1.6	<5.4	6.4	7.8	<0.4	<0.4	<0.4	<0.9	<0.9	<1.4	<1.4	<1.1
PR-01	PACIFIC OYSTER : SAVARY ISLAND - RACE PT (12.9 KM - NW)	SOFT TISSUE	4	2.09	<1.2	<1.2	<1.0	<1.0	<1.0	<1.0	<1.3	<1.3	<2.6	120.0	290.0	<0.7	<0.7	<0.7	<1.0	<1.0	<1.0	<1.0	<2.2
PR-02	PACIFIC OYSTER : SCUTTLE BAY (6.5 KM - NW)	SOFT TISSUE	5	1.70	<1.0	10.0	<1.1	3.2	<0.7	<0.7	<1.2	<1.2	<3.0	360.0	530.0	<0.5	<0.5	4.0	<1.0	<1.0	<1.4	<1.4	<2.1
PR-04	PACIFIC OYSTER : MALASPINA STRAIT (2.2 KM - NNW)	SOFT TISSUE	5	0.86	1.2	1.2	<1.2	<1.2	<2.8	<0.8	<1.0	<1.0	<3.5	110.0	150.0	<0.6	<0.6	<0.6	<0.8	<0.8	<1.1	<1.1	<0.9
PR-05	PACIFIC OYSTER : POWELL RIVER (1.0 KM - NE)	SOFT TISSUE	4	0.89	<0.9	<0.9	<0.9	<0.9	<0.7	2.2	<1.1	<1.1	<3.5	170.0	250.0	<0.5	<0.5	<0.5	<0.7	<0.7	<1.0	<1.0	<1.0
PR-06	PACIFIC OYSTER : MALASPINA STRAIT (2.0 KM - SE)	SOFT TISSUE	4	1.06	<0.6	<0.6	<0.9	<0.9	<1.3	<1.3	<0.8	<0.8	<2.4	46.0	65.0	<0.7	<0.7	<0.7	<1.0	<1.0	<0.8	<0.8	<2.2
PR-07	PACIFIC OYSTER : VESTVIEW (5.2 KM - SSE)	SOFT TISSUE	6	0.93	<0.6	<0.6	<1.1	<1.1	<0.8	<0.8	<1.3	<1.3	<1.6	15.0	30.0	<0.8	<0.8	<0.8	<1.0	<1.0	<1.2	<1.2	<1.2

TABLE 15 - [redacted] RESULTS (WET WEIGHT) - BARIUM (BARIUM)

SITE ID.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123678 HCDD	TOTAL HCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23678 PCDF	TOTAL PCDF	234678 HCDF	TOTAL HCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
BC-C1	[redacted] CRAB : [redacted] - JACK PT (3.5 KM - NNW)	MUSCLE	2	0.82	<0.6	<0.6	<1.5	<1.5	<0.8	<0.8	<0.8	<0.8	<2.0	2.9	3.6	<0.5	<0.5	<0.5	<1.1	<1.1	<0.8	<0.8	<2.9
BC-C1	[redacted] CRAB : [redacted] - JACK PT (3.5 KM - NNW)	MUSCLE	2	0.70	<0.4	<0.4	<0.9	<0.9	<0.9	<0.9	<0.8	<0.8	<1.6	2.0	2.0	<0.5	<0.5	<0.5	<0.9	<0.9	<1.0	<1.0	<1.3
BC-C1	[redacted] CRAB : [redacted] - JACK PT (3.5 KM - NNW)	MUSCLE	2	0.84	<0.7	<0.7	<1.5	<1.5	<1.5	<1.5	<2.2	<2.2	<12.0	2.0	2.0	<0.9	<0.9	<0.9	<1.0	<1.0	<2.5	<2.5	<6.7
BC-C1	[redacted] CRAB : [redacted] - JACK PT (3.5 KM - NNW)	HEPATOPANCREAS	6	0.78	2.1	2.1	<0.3	<0.3	<3.7	78.0	12.0	18.0	<3.5	130.0	160.0	<1.5	<1.5	30.0	<2.4	53.0	11.0	11.0	<3.4
BC-C2	[redacted] CRAB : [redacted] BAY (4.2 KM - NE)	MUSCLE	2	1.01	<0.6	<0.6	<1.2	<1.2	<1.1	11.3	<1.5	<1.5	<2.5	15.0	17.0	<0.4	<0.4	<0.4	<0.9	<0.9	<1.3	<1.3	<2.7
BC-C2	[redacted] CRAB : [redacted] BAY (4.2 KM - NE)	MUSCLE	2	0.80	<0.4	<0.4	<1.2	<1.2	<0.8	1.4	<1.0	<1.0	<3.0	6.0	8.2	<0.5	<0.5	<0.5	<0.8	<0.8	<0.7	<0.7	<2.9
BC-C2	[redacted] CRAB : [redacted] BAY (4.2 KM - NE)	MUSCLE	2	0.55	<0.9	<0.9	<0.9	<0.9	<2.1	3.0	<0.8	<0.8	<9.9	5.2	5.2	<0.8	<0.8	<0.8	<2.0	<2.0	<2.1	<2.1	<5.0
BC-C2	[redacted] CRAB : [redacted] BAY (4.2 KM - NE)	HEPATOPANCREAS	6	0.61	0.4	0.4	6.2	6.2	<1.1	100.0	<3.0	<3.0	<4.4	190.0	220.0	<1.1	1.0	1.0	<1.3	<1.3	<1.4	<1.4	<1.3
BC-C3	[redacted] CRAB : [redacted] CHANNEL (2.5 KM - SE)	MUSCLE	2	0.97	0.7	0.7	<2.3	<2.3	<1.5	7.7	<2.0	<2.0	<2.5	9.1	11.0	<0.8	<0.8	<0.8	<1.2	<1.2	<2.2	<2.2	<1.9
BC-C3	[redacted] CRAB : [redacted] CHANNEL (2.5 KM - SE)	MUSCLE	2	0.87	<1.0	<1.0	<2.0	<2.0	<1.0	12.0	<3.3	<3.3	<6.0	17.0	20.0	<1.1	<1.1	<1.1	<2.2	<2.2	<2.3	<2.3	<2.6
BC-C3	[redacted] CRAB : [redacted] CHANNEL (2.5 KM - SE)	MUSCLE	2	1.05	<0.7	<0.7	<0.8	<0.8	<1.2	13.0	<0.5	<0.5	<2.0	16.0	19.0	<0.8	<0.8	<0.8	<1.0	<1.0	<0.7	<0.7	<1.6
BC-C3	[redacted] CRAB : [redacted] CHANNEL (2.5 KM - SE)	HEPATOPANCREAS	6	10.20	20.0	31.0	54.0	140.0	<1.0	1200.0	33.0	49.0	<4.4	910.0	1200.0	<1.1	20.0	35.0	<0.7	99.0	<1.2	18.0	<2.2
BC-C4	DUCK CRAB : [redacted] CHANNEL (4.4 KM - SSE)	MUSCLE	2	N/A	<0.4	<0.4	<0.7	<0.7	<0.7	<0.7	<0.4	<0.4	<1.7	2.3	3.7	<0.4	<0.4	<0.4	<0.6	<0.6	<0.6	<0.6	<0.9

TABLE 15 (cont.) - 2[illegible]/DIBENZOFURAN RESULTS (PPT WET WEIGHT) HARBINO (HARBAC)

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL H8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL H8CDF
BC-C4	DUCK CRAB : DUNSMUIR/LADD CHANNEL (0.4 KM - SSE)	MUSCLE	2	N/A	<0.8	<0.8	<1.1	<1.1	<1.2	<1.2	<0.8	<0.8	<2.0	3.8	6.2	<0.8	<0.8	<0.8	<1.0	<1.0	<1.5	<1.5	<1.0
BC-C8	DUCK CRAB : DUNSMUIR/LADD CHANNEL (0.4 KM - SSE)	MUSCLE	2	N/A	<0.3	<0.3	<0.4	<0.4	<0.6	<0.6	<0.6	<0.6	<2.0	1.5	2.8	<0.2	<0.2	<0.2	<0.5	<0.5	<0.7	<0.7	<1.0
BC-C8	DUCK CRAB : DUNSMUIR/LADD CHANNEL (0.4 KM - SSE)	MUSCLE	2	N/A	<0.6	<0.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<6.1	2.1	3.8	<0.5	<0.5	<0.5	<1.0	<1.0	<1.1	<1.1	<3.3
BC-C8	DUCK CRAB : DUNSMUIR/LADD CHANNEL (0.4 KM - SSE)	MUSCLE	2	N/A	<0.8	<0.8	<1.2	<1.2	<1.4	<1.4	<1.3	<1.3	<5.5	<0.5	<0.5	<0.6	<0.6	<0.6	<1.5	<1.5	<1.5	<1.5	<5.2
BC-C8	DUCK CRAB : DUNSMUIR/LADD CHANNEL (0.4 KM - SSE)	HEPATOPANCREAS	6	2.72	<0.8	<0.8	1.4	1.4	<0.9	31.0	<0.8	0.7	<3.3	42.0	62.0	<0.9	<0.9	<0.9	<0.6	<0.6	<1.0	<1.0	<1.6
BC-Y1	ENGLISH SOLE : PAPOOSE CHANNEL (6.5 KM - NNE)	FILLET	2	5.88	1.3	1.3	2.6	2.6	<1.0	10.0	<0.9	<0.9	<2.0	30.0	30.0	<0.4	<0.4	<0.4	<0.7	<0.7	<1.1	<1.1	<1.7
BC-Y1	ENGLISH SOLE : PAPOOSE CHANNEL (6.5 KM - NNE)	LIVER	9	8.96	4.0	4.0	10.0	10.0	<1.7	60.0	2.0	2.0	4.0	76.0	76.0	<0.6	2.5	2.5	<1.9	<1.9	<1.1	<1.1	<3.6
BC-Y2	ENGLISH SOLE : DUNSMUIR/LADD CHANNEL (1.0 KM - N)	FILLET	2	1.37	<0.5	<0.5	<0.8	<0.8	<1.1	1.2	<1.2	<1.2	<1.6	6.2	6.2	<0.4	<0.4	<0.4	<0.9	<0.9	<1.0	<1.0	<2.0
BC-Y2	ENGLISH SOLE : DUNSMUIR/LADD CHANNEL (1.0 KM - N)	LIVER	6	N/A	2.0	2.0	6.5	6.5	<1.0	89.0	3.0	3.0	<1.7	60.0	60.0	<0.6	2.3	2.3	<2.1	<2.1	<2.7	<2.7	<2.0
BC-Y3	ENGLISH SOLE : DUNSMUIR/LADD CHANNEL (1.0 KM - NNW)	FILLET	2	N/A	<1.1	<1.1	<1.0	<1.0	<2.2	<2.2	<2.1	<2.1	<5.1	2.2	2.2	<0.6	<0.6	<0.6	<2.0	<2.0	<2.1	<2.1	<0.5
BC-Y3	ENGLISH SOLE : DUNSMUIR/LADD CHANNEL (1.0 KM - NNW)	LIVER	8	N/A	<0.8	<0.8	<1.7	<1.7	<1.6	10.0	<1.3	<1.3	<3.2	23.0	23.0	<0.8	0.9	0.9	<1.2	<1.2	<1.7	<1.7	<4.8
BC-Y4	ENGLISH SOLE : BC CONTROL GROUP (0.0 KM - S)	FILLET	2	2.33	<0.4	<0.4	2.0	2.0	<0.8	5.7	<0.4	<0.4	<0.9	12.0	12.0	<0.3	<0.3	<0.3	<0.7	<0.7	<0.6	<0.6	<0.9
BC-Y4	ENGLISH SOLE : BC CONTROL GROUP (0.0 KM - S)	LIVER	10	8.36	3.0	3.0	11.0	11.0	<1.9	50.0	<1.7	<1.7	<6.4	69.0	69.0	<1.0	<1.0	<1.0	<2.1	<2.1	<2.0	2.0	<4.1

TABLE 15 (cont.) - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - NAVAINO (NAVNAC)

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123678 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23678 PCDF	TOTAL PCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
NC-T1	SLOUSTRIPE SHRIMP : PASQUAT CHANNEL (6.5 KM - NNE)	TAIL MUSCLE	11	1.24	<0.5	<0.5	<1.2	<1.2	<0.8	1.2	<2.1	<2.1	<1.6	6.0	6.0	<0.5	<0.5	<0.5	<0.6	<0.6	<1.5	<1.5	<1.7
NC-T2	SLOUSTRIPE SHRIMP : NORTHUMBERLAND CHANNEL (1.4 KM - N)	TAIL MUSCLE	15	1.04	<0.5	<0.5	<1.1	<1.1	<0.7	11.0	<2.0	<2.0	<2.0	10.0	10.0	<0.4	<0.4	<0.4	<0.9	<0.9	<1.7	<1.7	<1.2
NC-T4	DUMPSACK SHRIMP : NE CHURCY GROUP (0.8 KM - S)	TAIL MUSCLE	15	1.39	<0.6	<0.6	<1.0	<1.0	<1.6	<1.6	<0.3	<0.3	<1.0	4.0	4.0	<0.5	<0.5	<0.5	<1.0	<1.0	<1.1	<1.1	<1.3
NC-S2	NAVAL CLAM : NESCARSO RAT (4.2 KM - NE)	SOFT TISSUE	22	1.16	<0.4	<0.4	<1.3	<1.3	<0.5	1.6	<2.3	<2.3	<2.7	7.9	9.9	<0.5	<0.5	<0.5	<0.6	<0.6	<1.6	<1.6	<1.1
NC-S4	NATIVE LITTLE-NECK CLAM : NAVAINO - REYNOLDS PT (6.3 KM - S)	SOFT TISSUE	10	1.10	<0.6	<0.6	<0.9	<0.9	<0.9	<0.9	<2.3	<2.3	<1.7	2.6	3.3	<0.5	<0.5	<0.5	<1.0	<1.0	<1.6	<1.6	<2.2
NC-01	PACIFIC OYSTER : NAVAINO - JACK PT (3.1 KM - NNW)	SOFT TISSUE	8	1.92	<0.9	<0.9	<1.0	<1.0	<1.2	5.7	<1.5	<1.5	<3.9	50.0	82.0	<0.7	<0.7	<0.7	<1.0	<1.0	<1.8	<1.8	<2.4
NC-02	PACIFIC OYSTER : HUDGE IS. - WESY (5.1 KM - SSE)	SOFT TISSUE	4	3.30	<0.7	<0.7	<0.7	<0.7	<1.4	4.6	<3.8	<3.8	<3.4	30.0	50.0	<0.6	<0.6	<0.6	<1.0	<1.0	<2.7	<2.7	<2.1

TABLE 16 - [illegible] CROFTON

SITE NO.	SPECIES/SITE (DISTANCE FROM O.TFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123478 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
CF-C2	DUNGENESS CRAB : STUART CHANNEL (3.7 KM - NW)	MUSCLE	2	0.77	<0.6	<0.6	<1.0	<1.0	<0.8	6.9	<1.0	<1.6	<0.8	8.4	10.0	<0.6	<0.6	<0.6	<0.5	<0.5	<1.0	<1.0	<2.6
CF-C2	DUNGENESS CRAB : STUART CHANNEL (3.7 KM - NW)	MUSCLE	2	1.06	<0.5	<0.5	<1.4	<1.4	<0.9	7.5	<1.0	<1.0	<0.1	8.0	9.6	<0.5	<0.5	<0.5	<0.6	<0.6	<0.8	<0.8	<1.6
CF-C2	DUNGENESS CRAB : STUART CHANNEL (3.7 KM - NW)	MUSCLE	2	1.02	<0.4	<0.4	<0.8	<0.8	<0.7	6.4	<0.8	<0.8	<2.0	5.7	7.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.7	<0.7	<1.2
CF-C2	DUNGENESS CRAB : STUART CHANNEL (3.7 KM - NW)	HEPATOPANCREAS	6	13.00	12.0	18.0	18.0	73.0	<0.8	550.0	9.3	16.0	7.5	360.0	490.0	3.2	6.8	42.0	<0.6	48.0	<1.6	<1.6	<4.6
CF-C3	DUNGENESS CRAB : STUART CHANNEL (1.8 KM - NW)	MUSCLE	2	0.94	<0.6	<0.6	<1.5	<1.5	<0.7	7.4	<0.9	<0.9	<1.6	13.0	15.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.8	<0.8	<1.2
CF-C3	DUNGENESS CRAB : STUART CHANNEL (1.8 KM - NW)	MUSCLE	2	1.10	<0.5	<0.5	<1.2	<1.2	<0.5	8.7	<0.6	<0.6	<1.2	12.0	16.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.6	<0.6	<0.7
CF-C3	DUNGENESS CRAB : STUART CHANNEL (1.8 KM - NW)	MUSCLE	2	0.97	<1.0	<1.0	<3.0	<3.0	<2.1	15.0	<2.6	<2.6	<6.6	20.0	27.0	<1.3	<1.3	<1.3	<1.6	<1.6	<3.1	<3.1	<6.4
CF-C3	DUNGENESS CRAB : STUART CHANNEL (1.8 KM - NW)	HEPATOPANCREAS	6	8.55	20.0	28.0	68.0	130.0	<1.8	1000.0	12.0	20.0	<0.7	670.0	890.0	11.0	18.0	71.0	<0.6	39.0	0.9	0.9	<3.1
CF-C4	DUNGENESS CRAB : SALTSPRING IS. - DOCK PT (3.9 KM - E)	MUSCLE	2	0.76	<1.0	<1.0	<2.3	<2.3	<1.9	<1.9	<0.1	<0.1	<9.4	2.2	2.2	<1.2	<1.2	<1.2	<1.5	<1.5	<2.1	<2.1	<0.4
CF-C4	DUNGENESS CRAB : SALTSPRING IS. - DOCK PT (3.9 KM - E)	MUSCLE	2	1.13	<1.4	<1.4	<1.8	<1.8	<2.0	15.0	<2.4	<2.4	<13.0	9.8	12.0	<1.8	<1.8	<1.8	<1.7	<1.7	<3.1	<3.1	<3.4
CF-C4	DUNGENESS CRAB : SALTSPRING IS. - DOCK PT (3.9 KM - E)	MUSCLE	2	1.12	<0.8	<0.8	<2.4	<2.4	<1.5	1.9	<1.3	<1.3	<3.9	6.3	7.2	<1.2	<1.2	<1.2	<1.1	<1.1	<2.3	<2.3	<2.3
CF-C4	DUNGENESS CRAB : SALTSPRING IS. - DOCK PT (3.9 KM - E)	HEPATOPANCREAS	6	7.69	12.0	16.0	29.0	76.0	<0.5	510.0	8.6	14.0	<2.0	310.0	460.0	2.2	4.1	11.0	<0.3	9.2	2.0	2.0	<1.6
CF-C5	DUNGENESS CRAB : OSBORN BAY (2.8 KM - S)	MUSCLE	2	0.71	<1.0	<1.0	<1.8	<1.8	<1.4	11.0	<1.8	<1.8	<5.2	19.0	22.0	<0.9	<0.9	<0.9	<1.0	<1.0	<1.5	<1.5	<2.6

TABLE 16 (cont.) - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - CROFTON

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
CF-C5	DUNGENESS CRAB : OSBORN BAY (2.0 KM - S)	MUSCLE	2	N/A	<0.8	<0.8	<1.3	<1.3	<0.7	12.0	<0.9	<0.9	<1.6	16.0	19.0	<0.6	<0.6	<0.6	<0.5	<0.5	<0.7	<0.7	<0.8
CF-C5	DUNGENESS CRAB : OSBORN BAY (2.0 KM - S)	MUSCLE	2	0.90	2.1	2.1	4.5	4.5	<1.4	35.0	<1.4	<1.4	<4.6	60.0	83.0	<0.6	<0.6	<0.6	<1.1	<1.1	<1.5	<1.5	<2.8
CF-C5	DUNGENESS CRAB : OSBORN BAY (2.0 KM - S)	HEPATOPANCREAS	6	9.92	21.0	24.0	30.0	61.0	<0.6	690.0	10.0	17.0	8.2	580.0	730.0	2.0	9.6	20.0	<0.8	12.0	<0.4	<0.4	<1.4
CF-C6	DUNGENESS CRAB : BOOTH BAY (6.0 KM - SE)	MUSCLE	2	0.91	1.1	1.1	2.4	5.8	<1.7	47.0	<1.2	<1.2	<3.7	35.0	47.0	<0.6	<0.6	1.0	<0.9	<0.9	<1.3	<1.3	<2.8
CF-C6	DUNGENESS CRAB : BOOTH BAY (6.0 KM - SE)	MUSCLE	2	0.94	2.0	2.0	7.3	20.0	<1.0	69.0	<0.9	<0.9	<1.9	110.0	140.0	<0.9	1.4	5.1	<0.8	<0.8	<0.8	<0.8	<1.1
CF-C6	DUNGENESS CRAB : BOOTH BAY (6.0 KM - SE)	MUSCLE	2	0.80	0.6	0.6	<0.9	<0.9	<0.7	21.0	<0.6	<0.6	<2.1	15.0	21.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.6	<0.6	<0.8
CF-C6	DUNGENESS CRAB : BOOTH BAY (6.0 KM - SE)	HEPATOPANCREAS	6	10.10	33.0	43.0	110.0	320.0	<0.8	1900.0	16.0	26.0	<2.0	1100.0	1300.0	<0.6	20.0	36.0	<0.5	<3.0	6.3	6.3	<2.0
CF-C8	DUNGENESS CRAB : DUNGENE BAY (12.3 KM - SE)	MUSCLE	2	0.77	<1.0	<1.0	<1.7	<1.7	<1.5	<1.5	<1.1	<1.1	<6.0	2.6	2.6	<1.0	<1.0	<1.0	<0.9	<0.9	<1.4	<1.4	<1.9
CF-C8	DUNGENESS CRAB : DUNGENE BAY (12.3 KM - SE)	MUSCLE	2	1.00	0.4	0.4	0.6	0.6	<0.5	6.3	<0.6	<0.6	<0.7	8.9	10.0	<0.3	<0.3	<0.3	<0.2	<0.2	<0.5	<0.5	<0.4
CF-C8	DUNGENESS CRAB : DUNGENE BAY (12.3 KM - SE)	MUSCLE	2	1.00	<0.6	<0.6	<1.7	<1.7	<1.3	16.0	<1.3	<1.3	<5.3	10.0	12.0	<0.7	<0.7	<0.7	<1.1	<1.1	<1.8	<1.8	<3.6
CF-C8	DUNGENESS CRAB : DUNGENE BAY (12.3 KM - SE)	HEPATOPANCREAS	6	6.66	11.0	13.0	35.0	84.0	<1.1	540.0	5.7	9.7	<2.6	250.0	350.0	<0.6	4.0	6.0	<0.7	<0.7	2.7	2.7	<3.2
CF-C10	DUNGENESS CRAB : SATELLITE CHANNEL (15.3 KM - S)	MUSCLE	1	N/A	<0.7	<0.7	<1.0	<1.0	<1.0	2.5	<0.9	<0.9	<2.2	3.6	4.5	<0.4	<0.4	<0.4	<0.8	<0.8	<1.0	<1.0	<1.5
CF-C10	DUNGENESS CRAB : SATELLITE CHANNEL (15.3 KM - S)	MUSCLE	1	N/A	<0.8	<0.8	<1.3	<1.3	<1.3	2.6	<3.6	<3.6	<0.0	3.3	3.8	<0.6	<0.6	<0.6	<1.4	<1.4	<2.6	<2.6	<2.6

TABLE 16 (cont.) - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) CROFTON

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
CF-C10	DUNGENESS CRAB : SATELLITE CHANNEL (15.3 KM - S)	HEPATOPANCREAS	1	N/A	5.4	5.4	13.0	14.0	<0.6	260.0	13.0	19.0	7.1	140.0	190.0	<0.4	2.2	11.0	<0.3	8.9	<0.3	<0.3	<1.6
CF-C12	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.85	<0.7	<0.7	<1.5	<1.5	<0.9	2.3	<1.4	<1.4	<4.0	2.6	3.3	<0.7	<0.7	<0.7	<1.0	<1.0	<1.2	<1.2	<3.5
CF-C12	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.90	<0.4	<0.4	<0.9	<0.9	<0.9	<0.9	<1.3	<1.3	<1.8	2.7	3.0	<0.4	<0.4	<0.4	<0.6	<0.6	<0.8	<0.8	<1.2
CF-C12	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.90	<0.8	<0.8	<1.1	<1.1	<1.4	4.2	<2.6	<2.6	<2.7	3.3	3.3	<0.6	<0.6	<0.6	<1.2	<1.2	<2.6	<2.6	<1.9
CF-C12	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.73	<0.6	<0.6	<1.6	<1.6	<0.9	1.6	<1.1	<1.1	<3.3	2.3	2.8	<0.6	<0.6	<0.6	<0.7	<0.7	<1.3	<1.3	<1.9
CF-C12	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	HEPATOPANCREAS	6	12.10	5.0	5.0	<1.2	32.0	<0.8	420.0	20.0	30.0	10.0	100.0	250.0	<0.9	3.5	32.0	<0.9	20.0	6.9	6.9	<2.0
CF-C13	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.87	<0.2	<0.2	<0.5	<0.5	<0.7	7.6	<0.7	<0.7	<1.5	3.3	4.3	<0.4	<0.4	<0.4	<0.3	<0.3	<0.9	<0.9	<1.2
CF-C13	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.96	<1.0	<1.0	<0.7	<0.7	<0.9	1.9	<1.1	<1.1	<5.7	1.6	1.6	<0.7	<0.7	<0.7	<0.6	<0.6	<2.0	<2.0	<4.1
CF-C13	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	MUSCLE	2	0.90	<0.2	<0.2	<0.6	<0.6	<0.7	2.0	<0.6	<0.6	<2.0	2.5	3.1	<0.5	<0.5	<0.5	<0.6	<0.6	<1.3	<1.3	<1.6
CF-C13	DUNGENESS CRAB : COVICHAN BAY (16.0 KM - S)	HEPATOPANCREAS	6	8.51	5.3	6.2	<1.0	26.0	<0.6	260.0	19.0	40.0	9.9	140.0	190.0	<0.6	2.0	32.0	<0.7	26.0	5.4	5.4	<1.7
CF-T1	ENGLISH SOLE : STUART CHANNEL (9.3 KM - NNW)	FILLET	1	3.10	2.5	2.5	4.7	4.7	<0.9	9.5	<2.3	<2.3	<2.4	10.0	10.0	<0.6	<0.6	<0.6	<0.8	<0.8	<1.0	<1.0	<3.7
CF T1	ENGLISH SOLE : STUART CHANNEL (9.3 KM - NNW)	LIVER	10	11.00	5.6	5.6	9.3	9.3	<2.7	63.0	<3.1	<3.1	25.0	70.0	70.0	<1.4	<1.4	<1.4	<3.3	<3.3	<2.5	<2.5	<4.6
CF T2	ENGLISH SOLE : STUART CHANNEL (1.2 KM - NNE)	FILLET	1	1.23	<0.6	<0.6	<1.7	<1.7	<0.8	1.9	<2.1	<2.1	<2.4	5.9	5.9	<0.7	<0.7	<0.7	<0.8	<0.8	<1.4	<1.4	<2.5

TABLE 16 (cont.) - BIOACCUMULATION/BIOMAGNIFICATION RESULTS (PPT WET WEIGHT) - CROFTON

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TSCDD	TOTAL TACDD	12378 PSCDD	TOTAL PSCDD	123478 HSCDD	TOTAL HSCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OSCDD	2378 TSCDF	TOTAL TACDF	12378 PSCDF	23478 PSCDF	TOTAL PSCDF	234678 HSCDF	TOTAL HSCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OSCDF
CF-T2	ENGLISH SOLE : STUART CHANNEL (1.2 KM - NNE)	LIVER	9	0.79	4.2	4.2	10.0	10.0	<1.3	65.0	<3.6	<3.6	<4.1	100.0	100.0	<0.9	3.2	3.2	<2.2	<2.2	<1.7	<1.7	<0.7
CF-T3	ARROWTOOTH FLOUNDER : SATELLITE CHANNEL (10.4 KM - SSE)	FILLET	1	3.41	<0.7	<0.7	<1.6	<1.6	<0.8	<0.8	<1.7	<1.7	<2.3	6.9	6.9	<0.6	<0.6	<0.6	<0.7	<0.7	<1.4	<1.4	<2.4
CF-T3	ARROWTOOTH FLOUNDER : SATELLITE CHANNEL (10.4 KM - SSE)	LIVER	4	N/A	3.6	3.6	<2.7	<2.7	<2.7	9.0	<1.0	<1.0	<9.0	63.0	63.0	<1.0	<1.0	<1.0	<2.9	<2.9	<2.5	<2.5	<5.3
CF-T4	ENGLISH SOLE : COWICHAN BAY (15.2 KM - S)	FILLET	1	0.93	<0.5	<0.5	<1.4	<1.4	<0.8	<0.8	<1.5	<1.5	<2.3	2.7	2.7	<0.4	<0.4	<0.4	<0.8	<0.8	<1.2	<1.2	<2.2
CF-T4	ENGLISH SOLE : COWICHAN BAY (15.2 KM - S)	LIVER	4	N/A	<1.0	<1.0	12.0	12.0	<1.5	37.0	<1.4	<1.4	<4.7	34.0	34.0	<0.8	2.5	2.5	<1.3	<1.3	<1.5	<1.5	<2.9
CF-T1	SIDESTRIPE SHRIMP : STUART CHANNEL (9.3 KM - NNW)	TAIL MUSCLE	11	1.03	<0.7	<0.7	<0.8	<0.8	<0.6	1.4	<1.4	<1.4	<1.3	3.6	3.6	<0.4	<0.4	<0.4	<0.6	<0.6	<1.1	<1.1	<0.9
CF-T2	SIDESTRIPE SHRIMP : STUART CHANNEL (1.2 KM - NNE)	TAIL MUSCLE	11	1.59	<0.5	<0.5	<0.8	<0.8	<0.6	2.8	<0.8	<0.8	<0.9	4.4	4.4	<0.3	<0.3	<0.3	<0.5	<0.5	<0.6	<0.6	<0.6
CF-T3	SIDESTRIPE SHRIMP : SATELLITE CHANNEL (10.4 KM - SSE)	TAIL MUSCLE	13	N/A	<0.4	<0.4	<0.7	<0.7	<0.5	1.5	<0.9	<0.9	<0.9	5.0	5.0	<0.3	<0.3	<0.3	<0.5	<0.5	<0.7	<0.7	<0.5
CF-T4	SIDESTRIPE SHRIMP : COWICHAN BAY (15.2 KM - S)	TAIL MUSCLE	19	1.18	<0.5	<0.5	<0.7	<0.7	<0.7	2.3	<1.1	<1.1	N/A	3.2	3.2	<0.4	<0.4	<0.4	<0.6	<0.6	<0.9	<0.9	<0.9
CF-L2	NATIVE LITTLE-NECK CLAM : ESPER IS - JOSLING PT (4.7 KM - NNE)	SOFT TISSUE	16	1.12	<0.5	<0.5	<0.8	<0.8	<0.5	<0.5	<0.7	<0.7	<0.9	1.4	1.4	<0.3	<0.3	<0.3	<0.4	<0.4	<0.6	<0.6	<0.6
CF-L3	MANILA CLAM : STUART CHANNEL (3.1 KM - NW)	SOFT TISSUE	52	0.83	<0.5	<0.5	<1.0	<1.0	<0.7	<0.7	<1.1	<1.1	<2.4	4.3	4.3	<0.3	<0.3	<0.3	<0.7	<0.7	<1.0	<1.0	<0.5
CF-L4	NATIVE LITTLE-NECK CLAM : BOOTH BAY (6.0 KM - SE)	SOFT TISSUE	9	1.30	<0.4	<0.4	<0.6	<0.6	<0.6	<0.6	<1.0	<1.0	<1.0	1.7	1.7	<0.4	<0.4	<0.4	<0.5	<0.5	<0.8	<0.8	<0.7
CF-L5	NATIVE LITTLE-NECK CLAM : SATELLITE CHANNEL (10.0 KM - S)	SOFT TISSUE	24	N/A	<0.5	<0.5	<0.9	<0.9	<0.8	<0.8	<1.0	<1.0	<1.1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.6	<0.6	<0.8	<0.8	<0.8

TABLE 16 (cont.) - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - CROFTON

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
CF-01	PACIFIC OYSTER : DATHAM IS. (9.0 KM - NNW)	SOFT TISSUE	4	2.77	<0.8	<0.8	<1.3	<1.3	<1.1	2.5	<1.4	<1.4	<2.5	13.0	17.0	<0.7	<0.7	<0.7	<1.1	<1.1	<1.3	<1.3	<1.0
CF-02	PACIFIC OYSTER : STUART CHANNEL (3.1 KM - NW)	SOFT TISSUE	4	2.23	<0.6	<0.6	1.2	1.0	<0.5	15.0	<0.7	<0.7	1.4	32.0	46.0	<0.4	<0.4	<0.4	<0.6	<0.6	<0.5	<0.5	<0.9
CF-03	PACIFIC OYSTER : OSBORN BAY (3.9 KM - SSE)	SOFT TISSUE	4	2.34	<1.1	<1.1	<1.4	<1.4	<2.1	2.0	<0.6	<1.6	<10.0	35.0	46.0	<1.1	<1.1	<1.1	<2.5	<2.5	<5.0	<5.0	<10.0
CF-04	PACIFIC OYSTER : BOOTH BAY (6.8 KM - SE)	SOFT TISSUE	4	2.32	<0.8	<0.8	<1.2	<1.2	<0.9	3.7	<1.2	<1.2	<1.7	14.0	16.0	<0.5	<0.5	<0.5	<0.7	<0.7	<0.9	<0.9	<1.1
CF-05	PACIFIC OYSTER : MAPLE BAY (8.5 KM - SSE)	SOFT TISSUE	5	N/A	<0.6	<0.6	3.0	4.4	<0.8	22.0	<1.1	<1.1	2.6	60.0	76.0	<0.7	<0.7	<0.7	<0.8	<0.8	<1.0	<1.0	<1.1
CF-06	PACIFIC OYSTER : DUNCOTRE BAY (12.0 KM - SE)	SOFT TISSUE	5	4.22	<0.4	<0.4	<0.7	3.9	<0.4	8.7	<0.5	<0.5	3.0	35.0	48.0	<0.4	<0.4	<0.4	<0.4	0.5	<0.6	<0.6	<0.6
CF-07	PACIFIC OYSTER : COWICHAN BAY - NEARSHORE (13.0 KM - S)	SOFT TISSUE	4	N/A	<0.6	<0.6	<0.9	<0.9	<0.8	3.6	<1.1	<1.1	<1.3	9.0	11.0	<0.3	<0.3	<0.3	<0.7	<0.7	<1.0	<1.0	<0.9

TABLE 17 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - COWICHAN BAY (DOMAN FOREST PRODUCTS & WESTCAN TERMINALS)

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 T4CDD	TOTAL T4CDD	12378 P5CDD	TOTAL P5CDD	123478 H6CDD	TOTAL H6CDD	1234678 H7CDD	TOTAL H7CDD	TOTAL O8CDD	2378 T4CDF	TOTAL T4CDF	12378 P5CDF	23478 P5CDF	TOTAL P5CDF	234678 H6CDF	TOTAL H6CDF	1234678 H7CDF	TOTAL H7CDF	TOTAL O8CDF
DB-1	CLAM : COWICHAN BAY - BEARSHORE (0.1 KM - E)	SOFT TISSUE	15	0.77	<1.0	<1.0	<2.1	<2.1	<2.3	<2.3	<2.0	<2.9	3.0	1.9	1.9	<0.8	<0.8	<0.8	<2.0	<2.0	<1.4	<1.4	<2.3
DB-2	DUNGENESS CRAB : COWICHAN BAY - BEARSHORE (1.4 KM - SE)	MUSCLE	2	0.84	<1.0	<1.0	<2.4	<2.4	<1.4	<1.4	<2.2	<2.2	<2.4	2.1	2.1	<0.9	<0.9	<0.9	<2.5	<2.5	<1.4	<1.4	<2.5
DB-2	DUNGENESS CRAB : COWICHAN BAY - BEARSHORE (1.4 KM - SE)	HEPATOPANCREAS	2	2.56	1.5	1.5	<2.3	<2.3	<2.4	31.0	<1.7	3.1	<3.1	35.0	63.0	<2.0	<2.0	0.5	<2.2	<2.2	<1.5	<1.5	<3.3
DB-1	DUNGENESS CRAB : COWICHAN BAY - BEARSHORE (0 KM)	HEPATOPANCREAS	7	7.35	2.5	2.5	7.7	10.0	<1.5	153.0	13.0	26.0	<2.3	66.0	91.0	1.0	2.4	23.0	<1.1	23.0	4.1	5.4	<2.1
DB-1	DUNGENESS CRAB : COWICHAN BAY - BEARSHORE (0 KM)	MUSCLE	7	0.85	<0.9	<0.9	<1.5	<1.5	<1.9	3.1	<2.1	<2.1	<2.3	2.7	3.4	<0.6	<0.6	<0.6	<1.3	<1.3	<1.3	<1.3	<2.5

TABLE 18 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - KITIMAT ARM

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123478 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
1	DUNGENESS CRAB : ALCAN SMELTER AREA (1.3 KM - SW)	HEPATOPANCREAS	6	9.20	27.0	60.0	60.0	129.0	<2.1	503.0	16.0	26.0	<20.0	14.0	14.0	<0.6	<0.6	28.0	N/A	<5.1	<5.1	<5.1	<10.0
1	DUNGENESS CRAB : ALCAN SMELTER AREA (1.3 KM - SW)	HEPATOPANCREAS	12	7.50	29.0	58.0	73.0	177.0	<3.6	502.0	12.0	26.0	7.4	19.0	19.0	<2.4	<2.4	23.0	N/A	<7.3	<3.6	<3.6	<0.1
1	DUNGENESS CRAB : ALCAN SMELTER AREA (1.3 KM - SW)	HEPATOPANCREAS	12	7.90	28.0	55.0	68.3	139.3	<6.4	470.0	8.7	17.0	<3.5	18.0	18.0	<2.7	<2.7	23.0	N/A	<8.1	<3.2	<3.2	<0.1
2	DUNGENESS CRAB : KITIMAT BAY (ENTRANCE) (0.9 KM - ESE)	HEPATOPANCREAS	6	8.10	29.0	55.0	71.0	160.0	<3.1	502.0	15.0	15.0	<17.0	14.0	21.0	<3.5	<3.5	30.0	N/A	<22.0	<6.9	<6.9	<12.0
3	DUNGENESS CRAB : KITIMAT VILLAGE (3.7 KM - S)	HEPATOPANCREAS	6	7.50	27.0	69.0	76.0	179.0	<20.0	404.0	<20.0	<20.0	<42.0	<13.0	<13.0	<5.7	<5.7	36.0	N/A	<8.4	<16.0	<16.0	<42.0
4	DUNGENESS CRAB : GOBEIL BAY (26.8 KM - S)	HEPATOPANCREAS	6	3.30	<9.4	<9.4	<39.0	<39.0	<8.4	23.0	<17.0	<17.0	<18.0	<7.7	<7.7	<8.9	<8.9	<8.9	N/A	<11.0	<8.0	<8.0	<14.0
5	DUNGENESS CRAB : DISK CREEK (11.7 KM - SW)	HEPATOPANCREAS	6	6.30	37.0	67.0	72.0	193.0	<6.9	271.6	<18.0	<18.0	<20.0	<9.8	<9.8	<4.3	<4.3	16.0	N/A	<20.0	<8.0	<8.0	<20.0
5	DUNGENESS CRAB : DISK CREEK (11.7 KM - SW)	HEPATOPANCREAS	6	7.00	18.0	39.0	71.0	176.0	N/A	135.0	<9.2	<9.2	<10.0	3.0	3.0	<6.0	<6.0	7.5	N/A	<13.0	<6.5	<6.5	<11.0

TABLE 19 - 2378PCDD/DF/2378PCDF/DFFURAN RESULTS (PPT WET WEIGHT) - PRINCE RUPERT

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TCDD	TOTAL TCDD	12378 PCDD	TOTAL PCDD	123478 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TCDF	TOTAL TCDF	12378 PCDF	23478 PCDF	TOTAL PCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OCDF
RR-1	RINGBOLT CRAB : HORSE BASIN (6.3 KM - NE)	HEPATOPANCREAS	12	N/A	25.0	26.0	35.0	71.0	<1.3	410.0	5.2	6.0	<3.2	610.0	800.0	1.9	6.6	11.0	<0.5	<0.5	<0.8	<0.8	<1.6
RR-3	RINGBOLT CRAB : PORPOISE HARBOUR (0.3 KM - E)	HEPATOPANCREAS	11	N/A	140.0	150.0	70.0	150.0	<0.9	1700.0	<0.8	100.0	100.0	3200.0	4100.0	15.0	27.0	65.0	<0.4	5.0	<0.5	<0.5	<0.9
RR-3	MUSSELS : PORPOISE HARBOUR (0.3 KM - E)	SOFT TISSUE	52	N/A	7.5	7.5	<3.	<3.2	<2.5	190.0	<0.8	<0.8	<6.6	180.0	260.0	<1.4	<1.4	<1.4	<1.5	<1.5	<2.3	<2.3	<6)
RR-5	RINGBOLT CRAB : COAST IS. - SOUTH (6.3 KM - SW)	HEPATOPANCREAS	16	N/A	15.0	16.0	10.0	21.0	<0.8	260.0	2.0	2.0	<5.0	370.0	490.0	0.8	2.0	6.9	<0.7	<0.7	<1.0	<1.0	<2.5
SP-1	PINK SHRIMP : HORSE BASIN (6.5 KM - NE)	TAIL MUSCLE	49	N/A	<0.7	<0.7	<0.9	<0.9	<1.1	6.2	<1.6	<1.6	<5.6	17.0	22.0	0.6	0.6	<0.6	<0.9	<0.9	<1.4	<1.4	<2.0
SP-2	COONSTRIPE SHRIMP : PORPOISE HARBOUR (2.0 KM - S)	TAIL MUSCLE	55	N/A	5.9	5.9	<1.6	<1.6	<2.4	20.0	<3.5	<3.5	<12.0	130.0	130.0	<1.1	<1.1	<1.1	<2.0	<2.0	<2.9	<2.9	<6.1
SP-3	PINK SHRIMP : COAST IS. - WEST (6.2 KM - SW)	TAIL MUSCLE	49	N/A	5.7	5.7	1.6	1.6	<1.0	19.0	<2.0	<2.0	<10.0	120.0	130.0	<0.8	<0.8	<0.8	<1.4	<1.4	<2.3	<2.3	<5.2

TABLE 20 - DIBENZODIOXIN/DIBENZOFURAN RESULTS (PPT WET WEIGHT) - HOWE SOUND (PORT MELLON & WOOFIBRE)

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	SAMPLE TYPE	NO. COMP.	% LIPID	2378 TYCDD	TOTAL TYCDD	12378 PSCDD	TOTAL PSCDD	123678 HXCDD	TOTAL HXCDD	1234678 HPCDD	TOTAL HPCDD	TOTAL OBCDD	2378 TYCDF	TOTAL TYCDF	12378 PSCDF	23478 PSCDF	TOTAL PSCDF	234678 HXCDF	TOTAL HXCDF	1234678 HPCDF	TOTAL HPCDF	TOTAL OBCDF
I-3	DUNGENESS CRAB : SQUAMISH HARBOUR (1.0 KM - SW (M)/27.5 KM - NE (PM))	HEPATOPANCREAS	15	N/A	70.0	70.0	70.0	160.0	<3.5	1300.0	13.0	25.0	<4.4	4000.0	5200.0	37.0	81.0	170.0	<1.4	6.8	4.6	4.6	<2.1
I-3	MUSSELS : SQUAMISH HARBOUR (1.0 KM - SW (M))	SOFT TISSUE	61	N/A	<1.3	<1.3	<2.2	<2.2	<5.6	96.0	<0.6	<0.6	<60.0	110.0	130.0	<1.6	<1.6	<1.6	<3.3	<1.3	<7.2	<7.2	<59.0
I-5	DUNGENESS CRAB : SQUAMISH HARBOUR (7.9 KM - S (M))	HEPATOPANCREAS	15	N/A	57.0	58.0	58.0	120.0	<1.0	1200.0	5.6	7.1	<4.7	2000.0	3600.0	16.0	42.0	87.0	<0.6	2.7	<0.8	<0.8	<2.4
I-10	DUNGENESS CRAB : TOWNSHOUGH CHANNEL (0.0 KM - NE (PM))	HEPATOPANCREAS	15	N/A	330.0	350.0	96.0	240.0	<1.3	2400.0	22.0	36.0	<3.9	9100.0	15000.0	75.0	150.0	300.0	<0.8	12.0	<0.7	<0.7	<2.0
I-10(A)	MUSSELS : TOWNSHOUGH CHANNEL (1.0 KM - SW (PM))	SOFT TISSUE	51	N/A	<10.7	<10.7	<1.1	<1.1	<1.6	0.0	<3.2	<3.2	<27.0	44.0	48.0	<0.7	<0.7	<0.7	<1.3	<1.3	<2.6	<2.6	<14.0
I-11	DUNGENESS CRAB : TOWNSHOUGH CHANNEL (4.4 KM - S (PM))	HEPATOPANCREAS	15	N/A	240.0	250.0	80.0	190.0	<3.0	2100.0	6.3	6.3	<2.9	8700.0	11000.0	42.0	120.0	250.0	<1.6	9.3	<5.0	<5.0	<1.4
I-12	DUNGENESS CRAB : TOWNSHOUGH CHANNEL (7.5 KM - S (PM))	HEPATOPANCREAS	15	N/A	130.0	130.0	46.0	120.0	<1.1	720.0	11.0	15.0	<6.5	6700.0	6800.0	20.0	60.0	110.0	<0.6	<0.6	<1.0	<1.0	<1.7
I-17	DUNGENESS CRAB : HOOTACH CHANNEL (14.5 KM - E (PM)/16.5 KM - S (M))	HEPATOPANCREAS	15	N/A	42.0	45.0	33.0	33.0	<2.6	690.0	8.6	12.0	<17.0	1700.0	2200.0	10.0	25.0	35.0	<2.0	4.2	<4.1	<4.1	<8.5
I-17	DUNGENESS CRAB : HOOTACH CHANNEL (14.5 KM - E (PM)/16.5 KM - S (M))	HEPATOPANCREAS	15	N/A	41.0	41.0	40.0	40.0	<2.7	490.0	6.6	6.6	17.0	1700.0	1800.0	8.8	12.0	20.0	<0.4	3.0	<1.0	<1.0	7.7
I-19	DUNGENESS CRAB : QUEEN CHARLOTTE CHANNEL (26.8 KM - SE (PM)/31.2 KM - S (M))	HEPATOPANCREAS	15	N/A	29.0	33.0	22.0	57.0	<1.0	270.0	15.0	30.0	<13.0	1300.0	1500.0	5.3	14.0	40.0	<1.5	22.0	<1.9	<1.9	<6.4
T-1	SIDESTRIPE SHRIMP : SQUAMISH HARBOUR (2.0 KM - E (M))	TAIL MUSCLE	13	N/A	<1.6	<1.6	<2.0	<2.0	<0.5	<0.5	<7.0	<7.0	<46.0	140.0	140.0	<1.0	<1.0	<1.0	<3.6	<3.6	<6.4	<6.4	<23.0
T-5	SIDESTRIPE SHRIMP : TOWNSHOUGH CHANNEL (1.3 KM - SE (PM))	TAIL MUSCLE	20	N/A	6.2	6.2	<1.0	<1.0	<2.5	21.0	<3.0	<3.0	<3.0	230.0	260.0	<1.2	<1.2	<1.2	<2.0	<2.0	<3.2	<3.2	<6.7
T-6	SIDESTRIPE SHRIMP : TOWNSHOUGH CHANNEL (9.5 KM - S (PM))	TAIL MUSCLE	13	N/A	<2.1	<2.1	<2.2	<2.2	<6.9	6.9	<3.9	<3.9	<16.0	220.0	240.0	<1.0	<1.0	<1.0	<1.9	<1.9	<3.2	<3.2	<7.9

TABLE 20 (cont.) - [illegible] - HAKE SOUND (PORT HELLON & WOODFIBRE)

SITE NO.	SPECIES/SITE (DISTANCE FROM OUTFALL)	TISSUE TYPE	NO. COMP.	% LIPID	2378 TOTAL TOCDD	TOTAL TOCDD	12378 TOTAL PECDD	TOTAL PECDD	123678 TOTAL HXCDD	TOTAL HXCDD	1234678 TOTAL HPCDD	TOTAL HPCDD	TOTAL OCDD	2378 TOTAL TOCDF	TOTAL TOCDF	12378 TOTAL PECDF	23478 TOTAL PECDF	TOTAL PECDF	234678 TOTAL HXCDF	TOTAL HXCDF	1234678 TOTAL HPCDF	TOTAL HPCDF	TOTAL OCDF
9-8	SIDESTRIPE SHRIMP : QUEEN CHARLOTTE CHANNEL (22.7 KM - SE (PW))	TAIL MUSCLE	20	N/A	<1.1	<1.1	<2.1	<2.1	<6.5	<6.5	N/A	N/A	N/A	55.0	55.0	<1.0	<1.0	<1.0	<5.2	<5.2	N/A	N/A	N/A

APPENDIX I

QUALITY ASSURANCE GUIDELINES FOR DETERMINATION OF DIOXINS AND FURANS FOR ENVIRONMENTAL MONITORING

Environment Canada
Conservation and Protection

Laboratories
Pacific & Yukon Region

QUALITY ASSURANCE GUIDELINES FOR DETERMINATION OF DIOXINS AND FURANS FOR ENVIRONMENTAL MONITORING PROGRAMS

Version 1.0 November

INTRODUCTION

These quality assurance guidelines has been developed for analytical laboratories providing dioxin/furan data on water, sediment and tissue samp for environmental monitoring programs. They are based on a QA protocol developed by the Dioxin Quality Assurance Committee, comprised of analytica and Quality Assurance experts from Environment Canada and the Department of Fisheries and Oceans. The objectives of this intensive QA are:

- to maximize the generation of quality analytical data;
- to ensure complete documentation and defensibility of all data;
- to expedite data evaluation and acceptance with a minimum inconvenience to Environment Canada and contract labs; an
- to clearly define the various QA requirements that must b followed.

Since highly accurate and precise results at the parts-per-trillion and -quadrillion level are required, it is essential that laboratories follow these guidelines closely. This does not infer that they should not follow their own internal QA program as well.

These guidelines are divided into 4 sections:

(a) Analytical Procedures

(b) Data Reporting and Evaluation Procedures

(c) Additional QA Requirements

(d) Reference Materials

For further information, contact:

Director, Laboratories
Conservation and Protection
Environment Canada
4195 Marine Drive
West Vancouver, B. C. V7V 1N8

tel. (604)666-6767 FAX (604)666-4895

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A. ANALYTICAL PROCEDURES

1. Sample Sets

All samples will be processed in batches. A minimum of 20% of the samples must be analyzed in duplicate. For a batch size of 9 samples or less, a minimum of 1 method blank and one reference sample must be processed with the samples. For more than 9 samples, at least two method blanks and two reference samples must be analyzed. (A method blank is defined as all surrogates, reagents and cleanup steps with no sample matrix present.) The reference material may be spiked with known quantities of various isomers. Laboratories will follow their own internal QA protocols as well.

Example of sample batch =	6 samples
	1 method blank
	2 replicates
	1 reference
	10

The National Water Research Institute has available two freshwater sediment reference materials which are considered satisfactory where sediment analyses are being conducted (see Section D for further information). Other reference materials may be acceptable as well.

2. Sample Sizes

It is expected that 4 L of each fresh water sample will be required to achieve the detection limits specified in Table 2. One liter of each effluent sample must be analyzed.

A minimum of 10 g (wet weight) of tissue must be analyzed. Results are to be reported in wet weight.

A minimum of 5 g (air-dried weight) of each sediment sample must be analyzed. Oven-dried (O.D.) weight must be determined and used in calculations.

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3. Surrogate Spiking

Prior to extraction, each sample must be spiked in its extraction vessel with 100 uL of the surrogate standard solution (see Table 1).

4. Extraction and Cleanup

All samples will be extracted and cleaned up by the lab's regular validated extraction and cleanup procedures.

5. Recovery Standard and Final Extract Volume

The cleaned up extract will be taken just to dryness in a clean, new 100 uL cone-shaped vial under a gentle stream of nitrogen and 20 uL of the Recovery Standard solution (see Table 1) added. This will be used to assess surrogate recoveries.

6. Quantitation

The Daily Calibration Standard solution, containing native and labelled PCDD/PCDF compounds, is listed in Table 1. The ion masses to be monitored for determining sample results are also shown in Table 1. This solution must be run daily (at the beginning of the day and every 8 hrs. thereafter, including after the last sample analysis) to update relative response factors (RRFs) determined during periodic multi-level calibrations (see Section C, para. 9). The daily RRF's must be +/- 15% of the originally determined values, or they must be completely re-established by multi-level calibration.

Laboratories are to use internal standard procedures for quantitation using the Surrogate Standard Solution detailed in Table 1. The isotopically labelled surrogates serve as internal standards to correct for losses during processing of samples and to compensate for errors due to differences in injected volume and unnoticed variations in instrumental sensitivity.

Dioxin and furan results for each homologue are corrected for the recovery of the corresponding labelled surrogate dioxin congener, except for tetra-furan which are corrected for the recovery of their own labelled surrogates. The contractor will provide examples of all equations used to calculate surrogate recoveries, to determine relative response factors between native and surrogate compounds, and to determine PCDD/PCDF concentrations in the sample.

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7. Criteria for PCDD/PCDF Identification

Since many compounds can interfere with the determination of PCDDs and PCDFs, it is of utmost importance that positive identifications be made. The criteria for PCDD/PCDF confirmation are listed below:

C1 - Peak responses of the quantitation ions must be greater than 3 times the background noise level.

C2 - Peak area (or height) ratios or spectral ion intensity ratios (from intensity list of spectrum of analyte peak) of the two monitored molecular ions for each congener group must be within +/- 20% of the ratio obtained for the corresponding components in the Daily Calibration Standard solution.

C3 - Peak maxima for all three monitored ions must coincide within +/-2 scan units for it to be included in total congener summation.

C4 - For isomer specific identification, peaks may be identified as 2,3,7,8-TCDD, 2,3,7,8-TCDF, P5CDD, H6CDD, H7CDD and O8CDD if they meet the first two criteria and co-elute with their isotopically-labelled surrogates within +/- 2 scan units.

C5 - no response must be seen at the m/e ratios identified for the M+ ions of hexachlorodiphenyl ethers identified in Table 1. These compounds can give the same fragment ions as the associated furans and yield a false positive result.

C6 - surrogate recoveries must fall within acceptable windows in Table 3 below.

8. Detection Limits

The detection limit must be reported for all sample results - not just for non-detectable values. The concentration units used to report the detection limit must be the same as that used for the sample. Detection limits must be corrected for surrogate recovery.

Table 2 below gives detection limits which must be met for data to be considered acceptable.

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TABLE 1 - STANDARDS AND SELECTED ION MASSES FOR PCDD/PCDF ANALYSIS

Standard	CONCENTRATION (pg/L)	QUANTITATION ION	CONFIRMATION IONS	INT. (1)
1. Daily Calibration Standard (Set B)				
DIOXINS -				
2,3,7,8-T4CDD	100	322	320, 259	
1,2,3,7,8-P5CDD	200	356	354, 293	
1,2,3,4,7,8-H6CDD	200	390	392, 327	
1,2,3,6,7,8-H6CDD	200	390	392, 327	
1,2,3,7,8,9-H6CDD	200	390	392, 327	
1,2,3,4,6,7,8-H7CDD	200	424	426, 361	
O8CDD	300	460	458, 395	
FURANS -				
2,3,7,8-T4CDF	100	306	304, 243	376
1,2,3,7,8-P5CDF	200	340	338, 277	410
2,3,4,7,8-P5CDF	200	340	338, 277	410
1,2,3,4,7,8-H6CDF	200	374	376, 311	446
1,2,3,6,7,8-H6CDF	200	374	376, 311	446
1,2,3,7,8,9-H6CDF	200	374	376, 311	446
2,3,4,6,7,8-H6CDF	200	374	376, 311	446
1,2,3,4,6,7,8-H7CDF	200	408	410, 345	478
1,2,3,4,7,8,9-H7CDF	200	408	410, 345	478
O8CDF	300	444	442, 379	514
(plus the Surrogates and Recovery Standards listed below)				
2. Surrogate Standard Solution (Set C)				
13C12-2,3,7,8-T4CDD	100	334	332	
13C12-1,2,3,7,8-P5CDD	100	368	366	
13C12-1,2,3,6,7,8-H6CDD	200	402	404	
13C12-1,2,3,4,6,7,8-H7CDD	200	436	438	
13C12-O8CDD	300	472	470	
13C12-2,3,7,8-T4CDF	100	318	316	
3. Recovery Standard (Set D)				
13C12-1,2,3,4,-T4CDD	100	334	332	

Note (1): molecular ion of possible chlorodiphenyl ether interferences.

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TABLE 2 DETECTION LIMITS

	Water (ppq)	Effluent (ppq)	Sediment (ppt)	Tissue (ppt wet)
T4CDD/F	2	10	10	2
P5CDD/F	5	20	20	5
H6CDD/F	10	30	30	10
H7CDD/F	15	40	40	15
O8CDD/F	20	50	50	20

An analyte is detectable when the quantitation ion response is greater than 3 times S/N ratio. However, if other qualitative criteria, such as correct ion ratios (congener specific determinations only), are not met, that measurement is reported as ND(R). An analyte is non-detectable when the quantitation ion response is less than 3 times S/N ratio. This will be reported as ND.

Detection limits corrected for surrogate recovery will be calculated in both cases as follows:

$$\text{D.L. (ppt)} = \frac{(3 \times N) \times (\text{Pg of internal std. added})}{\text{g sample} \times (\text{peak area for int. std.}) \times \text{RRF}}$$

RRF is the response factor for a native standard relative to the response factor for the surrogate. Noise (N), the estimated sum of electronic and chemical background, can be determined by manually drawing a line across the top of the average maximum noise peaks in the ion chromatogram of the quantitation ion for each homologue window. The height of the line is converted to area by multiplying by the peak area/peak height ratio determined from a surrogate peak.

Whenever possible, the noise for each homologue group will be determined from the actual chromatogram of the sample of interest. However, in cases where the quantitation ion channel contains a large peak which prevents observation of the noise (without rescaling and reprinting), the noise from the same channel in the method blank run may be used as a default value.

contd. ...

B. DATA REPORTING AND EVALUATION PROCEDURES

1. Data Reporting

All results must be reported in a format similar to Form A (attached).

The laboratory must retain, and provide for inspection on request, hard copies of all GCMS ion chromatograms, with areas and retention times clearly marked in ink for positive analyte peaks not printed by printer, spectra and spectral ion intensity lists used for ratio calculations for all analytical standards, sample and blank extracts and check solutions with all peaks identified as PCDD or PCDF congeners clearly indicated directly on the printouts in ink.

2. Data Evaluation

Environment Canada will examine all material requested and either accept or reject the data based upon the identification criteria, surrogate recoveries, comparison of duplicates and reference materials, performance on solutions of standards, etc. Duplicates must agree to within 50% for all target analytes.

Surrogate recoveries outlined in Table 3 below must be achieved for all matrices. In cases where recoveries of surrogates are less than the minimum recovery (in the 20 - 40% range with all other criteria being met) and there is a significant positive congener value at greater than twice the detection limit the data will be closely examined and may be accepted. However, if results are non-detectable, repeat analysis will be requested.

Laboratory performance may be further evaluated by inter-laboratory study with spiked or unspiked matrices. Environment Canada may also wish to audit individual laboratories and their operating procedures on-site.

C. ADDITIONAL QA REQUIREMENTS

Most of the following QA requirements are probably routine procedures in laboratories. However, they form an integral part of this QA protocol and must be followed:

1. Methodology Documentation must be available, kept up to date, and provided to Environment Canada on request.

2. Good laboratory practice - all equipment, sample concentrators, glassware, benches, etc. shall be kept clean during processing of these samples. No high level samples such as flyash shall be processed simultaneously with the sediment samples. This could lead to cross-contamination problems.

contd. ...

TABLE 3 SURROGATE STANDARD RECOVERY CRITERIA

Surrogate Standard	Amount Spiked (ng)	Acceptable Recovery (%)
13C12-2,3,7,8-T4CDD	2	40-120
13C12-1,2,3,7,8-P5CDD	2	35-120
13C12-1,2,3,6,7,8-H6CDD	4	30-120
13C12-1,2,3,4,5,7,8-H7CDD	4	25-120
13C12-O8CDD	6	20-120
13C12-2,3,7,8-T4CDF	2	40-120

3. Sample storage during workups: - all sample extracts shall be refrigerated at 4 deg.C in the dark when not needed for various cleanup steps.

4. Record keeping: - a set of laboratory notebooks will be dedicated these analyses and all records of sample treatment shall be recorded in these logs, which will be checked, signed and dated daily by a senior chemist. Such notebooks shall be available for audit upon request by Environment Canada.

5. Samples and final sample extracts will be suitably stored until Environment Canada accepts the analytical data.

6. Laboratories shall be responsible for GC column performance checking and shall provide details of such checks with sample reports:

   (i) check for isomer specificity (2,3,7,8-TCDD and -TCDF)

   (ii) use commercial window defining mixtures to set up GCMS windows for the various congener groups.

   (iii) run a column blank frequently to assess carryover.

contd. ...

(iv) verify and demonstrate that 5 pg 2,3,7,8-TCDD can be accurately seen at greater than 3 times S/N prior to each set of analyses.

7. Additional performance audits may involve blind analysis of spiked matrix samples, split audit samples sent to government labs, etc.

8. Instrument mass range shall be calibrated daily.

9. Quantitation linearity of the system shall be determined periodically by a 6 point calibration covering a concentration range of 5 to 1500 pg/uL PCDD/PCDF. Relative response factors (RRF's) (native std./labelled std.) are established using these 6 solutions. It is recommended that RRF's be calculated on the basis of triplicate analysis of each solution. The relative standard deviation (RSD) for each set of three RRFs determined from a single standard must be less than 10%. If this precision criterion is met, average RRFs over the entire calibration range can be calculated from the single point averages. The RSD of the six point average RRFs must be less than 20%. This latter value effectively corresponds to a response linearity criterion.

12. COCl loss must be monitored.

D. REFERENCE MATERIALS

The National Water Research Institute has two uncertified freshwater reference materials suitable for use under this protocol. They are available at a cost of $200 per bottle (containing approximately 20 g). Certified values are available for other organic compounds. Order these materials from:

Environment Canada
National Water Research Institute
Quality Assurance Program
P. O. Box 5050, 867 Lakeshore Road
Burlington, Ont. L7R 4A6

tel. (416) 336-4877
FAX (416) 336-4989

Cheques must be made payable to the Receiver General for Canada.

REVISION HISTORY

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Conservation & Protection
Pacific & Yukon Region

dioxem-v1.0

FORM A. ANALYTICAL RESULTS (for sediment samples)

Lab Name:
Sample ID:
Sample Description:
Sample Weight: g (air dry)
g (oven dry)

Date:
GC/MS:
Final Volume: uL

Congener	pg/O.D.g (1)	DL (2)	Homologue	pg/O.D.g (1)	DL (2)
2378-T4CDD			TCDD		
12378-P5CDD *			P5CDD		
123478-H6CDD *			H6CDD		
123678-H6CDD *			H7CDD		
123789-H6CDD *			OCDD		
1234678-H7CDD					
			Total PCDD		
2378-TCDF *					
12378-P5CDF *			TCDF		
23478-P5CDF *			P5CDF		
123478-H6CDF *			H6CDF		
234678-H6CDF *			H7CDF		
123789-H6CDF *			OCDF		
1234678-H7CDF					
1234789-H7CDF					
			Total PCDF		

Surrogate	Amount Added (ng)	Recovery (%)
13C12-TCDF		
13C12-TCDD		
13C12-P5CDD		
13C12-H6CDD		
13C12-H7CDD		
13C12-OCDD		

1. Results are corrected for surrogate recovery. Value for asterisked (*) isomer represents maximum possible amount, as it could co-elute with oth isomers. O.D.g = oven-dried weight in grams. ND = not detected. ND(R) = detected due to incorrect ratio.
2. DL = Detection Limit (ng/g).
3. NP = number of analyte peaks.